Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 64 NEW YORK, SATURDAY, SEPTEMBER 19, 1914 No. 12

Result of Secret Jobbers' Meetings

The Electrical Supply Jobbers' Association has doubtless convinced the Department of Justice that it is not a combination in restraint of trade. It opened one of its meetings at Niagara Falls last week to persuade the manufacturers of that fact, and also to show that it does not attempt to dictate prices. The shame of it all is that it should ever have been called on to make any such defense, or that its existence as a national body should ever have been threatened because of alleged illegal practices. But so long as the supply jobbers continue to meet behind closed doors, so long as they shroud their deliberations in secrecy, so long will their actions be viewed with suspicion. In this day and generation only those who have something to conceal or who purpose to do something they ought not to do meet regularly in secret. There are occasions when executive sessions are desirable and when matters of policy will dictate them, but when these are the rule rather than the exception suspicion is naturally aroused. We have implicit faith in the integrity of the jobbers' association as a national body. Its membership in the Society for Electrical Development shows that it can and will co-operate. The organization is a legitimate one. Its aims are honest and its purpose constructive. As one of the great divisions of the electrical industry it needs to give and to imbibe strength to and from the other branches. If it would measure up to the full stature of a national body, however, it must abandon the tactics of the ostrich. It has nothing to conceal and should not therefore, in justice to itself, invite the odium which attaches to closed sessions.

Economy or Government Taxes

The imposition of government taxes to meet the deficit in revenues resulting from the war is both expedient and necessary. Since the government is compelled to take this step, all that business men can ask is that the taxes shall be distributed fairly. No burden should be laid upon classes of industries or people unless they are capable, under the changed conditions of war, of bearing it without distress. The next question is whether the government will do what any plain, prudent business man does when he is confronted with seriously reduced revenues. The government should look about to see where it can economize. When the government commits itself to an expense it thereby commits some element of the population to a part in the payment of that expense. The less it commits itself, the less there is to be collected in taxation. For the legitimate purposes of the government every dollar that is wanted is proper. But for government waste, favoritism and unwise congressional appropriations not a penny should be spared under the emergency conditions of the times. Let the government officials who have been prodigal learn thrift. One great trouble with men who become habituated to public life is that they learn the ways of spending money but not of saving money. They are hardened spenders. When a tax is the simple means of overcoming deficits and no thought need be given to such a revenue-raising problem as ordinary business men confront the tax is likely to follow. But the resort to that easy course does not prevent government officials from reducing expenses if they but have the will to turn their activities in that direction.

Effect of War on Gas Lamps

Manufacturers of gas mantles, who have been largely dependent upon Germany for their supply of thorium, are now face to face with the problem of producing mantles from present stock and domestic materials, maintaining at the same time, if possible, former prices. If the war is of short duration, it may be that they will succeed, but the fact that the manufacturers are entering upon an undertaking of magnitude is shown by the tone of letters written by the heads of two large mantle-manufacturing companies and printed elsewhere in this issue. The seriousness of this effort to keep down costs is shown by the fact that operating gas companies have been asked to save mantle ash that this scrap may be used to replenish the manufacturers' thorium supply. If the present situation should bring an upward trend in mantle prices, the advantages already held by tungsten lamps will stand out more clearly to the purchasers, and the sales of gas-filled electric lamps and of lighting fixtures should be greatly accelerated.

Electrochemical Opportunities

One of the effects of the present terrible disturbance of the world's industries ought to be to awaken new interest in electrochemical matters in this country. In particular, the closing down of many of the Continental works will weigh heavily on the world's supply, and it looks as though attention might profitably be directed specially toward the manufacture of nitrates and nitric acid from the fixation of atmospheric nitrogen. As our readers well know, on the other side of the water there are many plants of this character, although some of the first impulses toward the exploitation of this field came from the inventors of our own country. The Scandinavian works, which are among the largest, are unaf-

fected, yet if the war continues for a considerable period, as it well may, the inevitable result will be to raise the prices of nitrates and nitric acid by a considerable amount, with small probabilities of a very rapid drop at the close of hostilities. Norway, we believe, holds the record for cheap energy production, some of the nitrate plants obtaining this from their own hydroelectric installations at a cost quoted as low as $5 or $6 per kilowatt per year. With such figures we can here perhaps hardly compete, but in many respects an electrochemical load, from its steadiness and the possibility in some instances of working it at off hours, is a highly desirable one. In fact, it is altogether likely that certain hydroelectric situations could be developed to furnish energy for eight or nine months a year when water is plenty at so low a figure as to attract electrochemical industries even if they had to work on short time or shut down during the months of low water. The utilization of hydraulic energy in such a form that it may be stored, so to speak, is a very important matter in utilizing the energy now running to waste, and the situation should encourage the upbuilding of such industries at this particular time. Nitrates for fertilizers find a ready market, and even fixation of atmospheric nitrogen directly into nitric acid, heretofore regarded as somewhat unprofitable, may be worth trying on a considerable scale.

Storage Batteries for Isolated Plant Service

Out of the smoke of battle comes a rather striking contribution to the arts of peace, as exemplified in central-station practice, in the form of a brief paper on a large Berlin storage-battery installation of which some account is given in our Digest. The particular plant considered is that of the Kaiser Hotel in Berlin. It is very well known that from the standpoint of the central station hotel loads are rather troublesome. They add heavily to the peak without affording a large amount of long-hour service. For many reasons the tendency has been to install an isolated plant in a large hotel like the one under consideration. In the original installation at the Kaiser Hotel use was made of producer-gas equipment. For the past few years, however, the load has been carried by the central station and excellent results have been obtained.

Instead of taking the large hotel load, amounting to about 400,000 kw-hr. per year, directly on the mains, use was made of a large storage battery to take care of the whole load. The battery is charged at off-the-peak hours when the energy can be obtained at the lowest possible price. The battery, feeding energy to a 2×220-volt three-wire system, is charged by means of a pair of motor boosters between 10 at night and 7 in the morning, or at the lightest hours of station load, when the added duty is welcome. The upshot of the matter is that, allowing against the battery full charges for care, depreciation and interest, the gain by its installation is not less than a sixth of the total cost of energy without it, which in turn showed economy over the local generation of energy.

This plant furnishes an excellent example of means for filling up the load curve at the station to the advantage of all parties concerned. The plan is one which may well be of frequent assistance in getting business from that class of large consumers which ordinarily draws heavily on the peak load. There has been considerable tendency among the larger American stations to coddle the big consumer to an extent which the character of his load does not in the least warrant. In fact, there is little doubt that in some such cases energy is furnished at little if any above cost, and in order to keep up the average earnings the smaller consumers have to pay somewhat heavily for the anxiety of the central station to suppress the isolated plant. The plan tried in the Kaiser Hotel gives the consumer the benefit of a legitimate low rate without burdening the station and distributing network at unseemly times.

Artificial Daylight

The article in this issue by Mr. M. Luckiesh on artificial daylight is an important contribution to the subject in that it deals with the use of the new gas-filled lamps modified by screens of colored glass to give a fair degree of efficiency and remain reasonably permanent. One of the fundamental difficulties in obtaining artificial daylight is to discover what daylight really is. The most casual consideration indicates that it is a very variable quality and that sunlight, whether direct or reflected from white clouds, is a very different thing from the light of the blue sky. Moreover, the variety of daylight desired for any particular use may represent either of these characters or something between them. To meet these varied requirements Mr. Luckiesh shows the results obtained from a bluish screen designed to give the effect of the northern sky, a screen giving an approximation to ordinary sunlight, and a still further modified screen of somewhat higher efficiency which perhaps may be regarded as approximately matching the sunlight of the late afternoon. The efficiency of the north-light screen is obviously very low even with the advantage of the gas-filled tungsten lamp as source. That of the other two is relatively better, since less of the longer waves of the spectrum have to be absorbed in order to obtain proper balance with the weak blue end of the source. Unquestionably for work where color matching is of importance such screens will be of considerable service, as indeed similar devices have already proved to be.

Considering the possible advantage of closely simulating the color of daylight in artificial illumination, it may well be questioned whether the game is worth the candle for general use, or indeed whether the artificial light may not actually be easier on the eyes than the natural light. Helmholtz once remarked that if an optician sent him an instrument as badly made from the optical standpoint as the human eye he would promptly return it, and from the standpoint of chromatic vision the eye is rather worse than in most respects. The ends of the spectrum, full red and deep blue, are fortunately

of very low luminosity, else we should never be able to get clear focus at all. The eye sets itself in focus for the rays of high luminosity in the center of the spectrum, and these as Mr. Luckiesh himself and others have shown give rather better vision than does the whole spectrum. It may therefore be considered questionable whether for ordinary purposes of seeing it is at all advantageous to increase the rays of low luminosity at the ends of the spectrum, which actually renders the retinal image less sharp, unless for the definite purpose of displaying particular color values. For this definite work artificial daylight is certain to have its use, and Mr. Luckiesh is to be congratulated on the advances he has made in this direction.

Electrical Securities

The effect of the war on the value of securities cannot yet be rightly estimated since the stock exchanges are still closed and there is little light on what few private transactions have been undertaken. Even if the prices were of record, they would convey little information as to the real values which would be established in the case of an open market. It seems to us, however, that the holders of electrical securities stand much better than the average chance of retaining good valuations through this time of stress. So far as manufacture goes, of course, there is a slackening demand owing to the inability to get ready money for construction work. Yet, since all the foreign countries which are large manufacturers of electrical goods are crippled in output even if the doors of their works are not already shut, it would seem that the market in those countries which are at peace would within a reasonable length of time make up to the American manufacturers all the temporary injury of the home market. Nobody can yet safely predict how long the present hostilities will last. The longer the war endures the more serious will be the crippling of manufacturing industries from lack of men and money, if not from actual destruction of property. Even Italy and Switzerland, not yet involved in the actual struggle, are seriously affected by mobilization and are liable at any time to be drawn into the war with all that that implies. It looks, therefore, as though the American manufacturers of electrical products, although temporarily inconvenienced, will find in widened export markets a valuable opportunity. As regards public utilities, there is even now being felt a slight adverse pressure, unlikely, however, to become serious.

Lessened activity in many lines of work, throwing many out of employment, is bound to produce a temporary effect even on the receipts of central stations and railway companies. As the immediate pressure is relieved, however, as it is likely ere long to be, the lost business will come back, so that it does not seem probable that receipts will suffer more than a very temporary setback. Electric service has come to be so much of a necessity that it should not be given up in any large measure unless during a period of depression unlikely to persist while the United States is the only great manufacturing country left in peaceful possession of the general market.

The effect of the war on this country is partly very real and partly psychological. Human nature becomes more or less hardened to long-drawn-out horrors, and capital, now held tight in unproductive isolation, will before long be coming out of retirement and looking after earnings. As it does so public utilities will find normal conditions of business returning, and there should be no considerable effect upon their earning values even though quotations may be somewhat lowered. This is no time, therefore, to let go of securities unless one is compelled to do so by necessity. Those who have interests in electrical manufacturing or operating enterprises would do well to rely on a reasonable assurance that earning values will hold up well as compared with those of other branches of industry less stable and not so firmly based.

Municipal Operation Versus Commission Regulation

If agitations for municipal ownership and operation of public utilities were confined to localities not now being served by private companies or to communities in which the service is unsatisfactory or unduly expensive, present central-station owners might feel secure in the knowledge of the fact that the former and present high-grade economical service would render their property immune from confiscation or destructive competition. Such, however, is not always the case. In some cases the only important feature taken into consideration seems to be the fact that the municipality has the legal right to own and operate a plant if a sufficient number of citizens so desire. One fact practically always overlooked by the advocates of municipal operation is that the underlying elements which spell success under private operation are lacking when the utility is operated by the municipality. Reference is here made to the belief on the part of the employees that their promotion in the company depends upon merit and not political influence, and the knowledge on the part of the manager that his success in life is inseparably associated with the success of the utility in meeting the needs of the public. The claim that the city must own and operate the lighting plant as it does the waterworks in order to obtain proper service for the citizens has little weight anywhere, and none at all in states in which the utilities are controlled by commissions. What the public wants is adequate and satisfactory service at reasonable rates, which result can be insured by proper commission regulation. Numerous examples can be cited to show that with privately operated utilities suitably regulated the result is much more satisfactory than with municipally operated utilities either with or without regulation. When the service is unsatisfactory or the rates too high the fault lies in the controlling commissions. The remedy is to be found in improved regulation and not in municipal operation.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

Boston Edison Purchases Energy in Bulk

The Metropolitan Water and Sewerage Board of Massachusetts has sold to the Edison Electric Illuminating Company of Boston for a five-year period the entire output of a hydroelectric plant which is to be built during the next year by the board at the Sudbury reservoir, in Southboro. This plant will be the second of its kind to be constructed by the State in connection with the Boston water-supply system, the first installation having been made at Clinton about three years ago. The Sudbury station will be a three-unit plant with a total output of about 3,000,000 kw-hr. per annum. Two units will use the discharge of the reservoir into the Weston Aqueduct, the third outfit utilizing the discharge of the reservoir into the so-called Framingham Reservoir No. 3.

Three-phase, sixty-cycle energy will be delivered by the State to the Edison system at the boundary of the State property. The plant will be in operation sixteen hours per day except on Sundays and legal holidays. The Edison company's bid was $6.25 per 1000 kw-hr. for all energy generated. The Connecticut River Transmission Company, which operates the most extensive high-voltage hydroelectric system in New England and which now purchases the greater part of the output from the Clinton station at $5.30 per 1000 kw-hr., offered to pay $5.50 per 1000 kw-hr., with the provision that the company would take not less than 1,000,000 kw-hr. yearly, and $3 per 1000 kw-hr. upon a guaranteed minimum purchase of 2,000,000 kw-hr. annually.

Electric Vehicle Course at Armour Institute

Prof. E. H. Freeman, of the Armour Institute of Technology, gave an informal talk to the Chicago Section of the Electric Vehicle Association on Sept. 8 concerning the new special course relating to electric vehicles now available at Armour Institute. The instruction given at Armour follows two lines—a regular four-year college course, and evening classes taking up more elementary studies. The special course in electric vehicles is an evening-class course. It consists of twenty lectures extending over a period of ten weeks, two lectures being given each week. The course is designed especially for practical men engaged during the daytime in electric-vehicle or garage work. The idea is to give instruction in the underlying principles relating to electric circuits, transformers, motor-generators and rectifiers, direct-current motors, storage batteries, controllers, various types of instruments, etc. A number of lectures will be given by men who are actively engaged in the automobile industry. The tuition fee for the course is $10, and Professor Freeman asked for the active co-operation of the Electric Vehicle Association.

Announcement was made of a proposed run from Pittsburgh to Philadelphia and return at the time of the Philadelphia convention of the parent association next month. The evening's program, which followed a dinner at the Hotel La Salle, was concluded by a motion-picture play entitled "Selling Electrical Vehicles."

Flood in Manila Interrupts Electric Service

Electric-lighting and street-railway service in Manila, P. I., was partially interrupted on Sept. 2 and 3 by a flood resulting from recent typhoons. According to cable advices received from the Manila Electric Railway & Light Company by its operating manager, the J. G. White Management Corporation, New York City, parts of the company's generating plant were under water, operation of the street railway was interrupted part of one day, and considerable difficulty was experienced in maintaining full electric service. On Sept. 3 electric service was improved and seventy-five cars were placed in operation. Normal service was resumed on the following day. Aside from slight damages to the roadbeds of the street railway and damage to a few cars, the electric-service company suffered little loss.

Boston Street-Lighting Situation

At a meeting of the City Council last week Mayor Curley of Boston presented a new draft of the proposed street-lighting contract designed to supersede the present agreement with the Edison Electric Illuminating Company. The draft was prepared by Corporation Counsel John A. Sullivan after three conferences with President Charles L. Edgar and Counsel Frederick M. Ives, of the Edison company. While providing for a ten-year agreement, it includes an important concession relative to rates. The previous price of $87.53 per year is named for each 6.6-amp magnetite arc lamp, with the provision that within ten days after the contract is signed it will be submitted at the request of both parties to the Massachusetts Gas and Electric Light Commission for decision as to the fairness of the above price. An adjoining clause declares that no change in the price will be made if the commission decides that the contract price is too low. If the board decides that the price above quoted is too high, the company will accept the ruling of the commission as to a fair price. Another concession is that only six months' notice instead of a year's warning shall be required in connection with the termination of the contract, and that in case of arbitration the board of appeal will not include a Massachusetts Institute of Technology professor, as named in the first draft, but will consist of three men, one chosen by each party and the third by these two. In discussing the proposed contract, Mr. Sullivan assailed the proposal to terminate the present contract without agreeing upon a new one, pointing out that if such action is taken the city will have to pay at the rate of $103.54 per lamp per year until the termination is effective, which cannot be in less than twelve months, and that a rate of $108.54 would thereafter have to be paid for one or two years while arbitration was proceeding. More than 4000 lamps are involved. Councilman Watson, upon being challenged by the Mayor, virtually admitted that his municipal-ownership plan, involving the expenditure of perhaps $20,000,000, was devised for political rather than for practical purposes. The matter was taken under advisement.

Municipal Ownership Agitation in Dayton

An ordinance was introduced in the Dayton (Ohio) Commission on Sept. 9 providing for the issue of $500,000 bonds to secure funds for the construction of a municipal light plant. The ordinance was promoted by the socialists of the city, who ask that the citizens be allowed to express their desires at the election on Nov. 3. Mr. L. W. O'Brien, who appeared before the commission, suggested that if a municipal plant is to be established the Dayton Power & Light Company's plant be purchased and that a bond issue of $5,000,000 be authorized for that purpose. He also stated that he is in a position to form a company to take over the municipal water-works system, which, he said, can be operated more economically and with greater satisfaction to the people than under the present plan. The fact that a tremendous amount of money will be needed in the near future by the city of Dayton for water-works rehabilitation, garbage disposal and street and river-front improvements will have an important bearing on the outcome, as will also the progressive attitude of the management of the Dayton Power & Light Company, which is serving the community efficiently at fair rates and which created a very favorable impression by the rapid rehabilitation of its electric-lighting properties in Dayton immediately after the flood.

Gas-Mantle Industry in Predicament

Since thorium, the base of the incandescent gas mantle, has to quite a large extent been imported from Germany and present conditions make it impossible to secure the product from that source, serious attention has been given to the problem of supplying the United States with mantles. Letters from heads of two large mantle manufacturers, recently published in the *Gas Record*, seem to indicate that these concerns are making a determined effort to prevent raising the prices of mantles. In one of these letters Mr. Sidney Mason, president of the Welsbach company, said in part:

"The European war has seriously unsettled the mantle industry in the United States, and if the gas-lighting industry is not called upon to suffer it will be due simply to the foresightedness of our company and its ability, due to its capital resources, in providing enormous and expensive stocks of raw materials. We will have a serious and difficult task to handle the situation so as to prevent entirely any possibility of impairment, which, in the interest of gas lighting, means that gas mantles of good grade must be supplied to the consumer without raising the price and without any interruption in deliveries.

"We do not consider ourselves in a congratulatory position; on the contrary, we are very much distressed and are regretful of the plight not only of the domestic competitors but as well of the manufacturers abroad. There is not a day that I am not receiving cables from England and South America from concerns representing in their market a similar relation to our position in the American market urging our assistance for a thorium supply, and who, when the test comes, are found to be in the class with the foolish virgins—'without oil.'

"We are now asking the gas companies' co-operation in making their demands to normal requirements in order that we shall have enough to go round and take care of everybody, and rigidly to conserve mantle ash, to be returned to us as augmenting our supply of thorium to enable us to keep to our announced plan of a reduction in price of high-grade mantles, made Aug, 1."

Mr. Charles R. Lindsay, Jr., president of the Lindsay Light Company, is less optimistic in a letter on the same subject and hints at increased prices. He says:

"I do not see any reason at the present time why the Lindsay Light Company should not be in shape to take care of our regular trade.

"It is true we use considerable material, such as glassware, thorium, chemicals, etc., part of which has heretofore been purchased in Germany, but I believe that it is only a question of a short time when we shall be in position to make practically all of our material here; but the cost of labor here will undoubtedly add considerably to the cost of these materials."

Progress in Accident-Prevention Work

Mr. M. W. Alexander, of Boston, engineer for the General Electric Company, delivered an instructive address at a joint meeting of the American Foundrymen's Association and the American Institute of Metals in Chicago on Sept. 8. His subject was "Safety in Foundry Operations," but much that he said was of general application. Speaking of the safety-first movement, Mr. Alexander stated that personal caution is the most important element in the prevention of accidents. Next to it comes order, which makes for safety. Directions to employees should be given as a guidance and not as an injunction. Warning signs are necessary. The speaker recommended the one word "Danger" on a red background, red being universally recognized as the color indicating danger. With this word perhaps one or two others might be added, as "High Voltage" or "Railroad Crossing." An arrow may be added to the sign to point to the source of danger.

Mr. Alexander displayed a new and very compact and complete first-aid outfit, the packages, bottles and appliances being contained in a glass jar provided with a handle. An ingenious device shown was material for a splint, consisting of a strip of woven "chicken wire" about 30 in. long and perhaps 6 in wide. This strip of woven wire is rolled up into a small package, but when needed as a temporary splint can be manipulated to the shape desired and is said to possess the strength and rigidity required.

End of Trust Legislation in Sight

The conferees on the Clayton bill have practically finished consideration of that measure, and it is expected that it will be presented to the House and Senate early next week. The measure, which passed the Senate on Sept. 2, was amended by the Senate in no less than ninety-five instances. These ninety-five amendments have furnished a mass of work for the conferees.

The federal trade commission bill is at the White House, ready for signature, and President Wilson is expected to sign that bill and the Clayton bill at the same time. The signature will mark the carrying out of the administration's anti-trust legislation program at this session. It has been decided to abandon at this session of Congress the Reyburn stock and bond bill because of the changed conditions brought about by the European war.

It is stated in authoritative circles in Washington that the conferees on the Clayton bill have decided to put back into it Section 2, stricken out by the Senate, which prohibits discrimination in prices. With reference to Section 4, which was stricken out of the House bill by the Senate and completely rewritten, and which relates to exclusive contracts, the conferees on the part of the House expect to obtain the consent of the Senate conferees to the use of the original House language. Section 3 of the Clayton bill, which would compel own-

ers or transporters of products of mines, oil or gas wells, or hydroelectric plants, to sell to any bona fide purchaser, was stricken out by the Senate and those who are familiar with the work of the conferees during the past week say that this section will be left out of the bill.

One of the big fights in connection with the Clayton bill was over the provisions which prohibit interlocking directorates. The Senate struck out entirely the House provision which prohibits interlocking directors in banks. This also is expected to remain out.

The Senate amendments to the section of the Clayton bill which would exempt labor unions from the operation of the anti-trust laws will stay in the bill, under the report of the conferees, it is said, as well as the Senate amendments to the clauses relating to injunctions against labor organizations and farmers' organizations. The Senate amendments in these respects are not so broad as the language of the original House bill.

Toward the end of the debate almost all of the fight in connection with the Newlands federal trade commission bill revolved around Section 5, dealing with unfair practices. Instead of using the words "unfair competition," the bill as it went to the White House was made to read "unfair methods of competition," a distinction which the courts may eventually define.

The findings of the proposed federal trade commission, under the law creating that body, are to be conclusive evidence instead of prima facie evidence.

At the White House it is said that President Wilson does not intend to appoint immediately the members of the commission created by this measure. As the bill has not yet been published and will not be for public use until it becomes a law by the President's signature, the exact language of the much-debated Section 5, around which many of the duties of the proposed commission will revolve, is of interest. In part it is as follows:

"That unfair methods of competition in commerce are hereby declared unlawful. The commission is hereby empowered and directed to prevent persons, partnerships or corporations, except banks and common carriers subject to the acts to regulate commerce, from using unfair methods of competition in commerce.

"Whenever the commission shall have reason to believe that any such person, partnership or corporation has been or is using any unfair method of competition in commerce, and if it shall appear to the commission that a proceeding by it in respect thereof would be to the interest of the public, it shall issue and serve upon such person, partnership or corporation a complaint stating its charges in that respect and containing a notice of a hearing upon a day and at a place therein fixed at least thirty days after the service of said complaint.

"If upon such hearing the commission shall be of the opinion that the method of competition in question is prohibited by this act, it shall make a report in writing in which it shall state its findings as to the facts, and shall issue and cause to be served on such person, partnership or corporation an order requiring such person, partnership or corporation to cease and desist from using such method of competition. Until a transcript of the record in such hearing shall have been filed in a circuit court of appeals of the United States, as hereinafter provided, the commission may at any time, upon such notice and in such manner as it shall deem proper, modify or set aside, in whole or in part, any report or any order made or issued by it under this section."

The court shall have power to affirm, modify or set aside the order of the commission. The decree shall be reviewable by the United States Supreme Court.

Report of Massachusetts Industrial Accident Board

The first annual report of the Massachusetts Industrial Accident Board, covering the year ended June 30, 1913, has been issued. It includes a statistical digest of 89,694 accidents, a statement of causes and injuries, and estimates of the cost of insurance under the workmen's compensation act. A large number of illustrations of approved methods of safeguarding machinery are printed. A valuable section discusses the accident-prevention work of various casualty companies, with an extended outline of the principles of safety engineering. The offices of the board are at 1 Beacon Street, Boston, Mass.

Commission Recommends Consolidation of Los Angeles Telephone Companies

The Public Utilities Commission of California has recommended that the Pacific Telephone & Telegraph Company and the Home Telephone Company, both of Los Angeles, be consolidated in 1916 so that any telephone user may communicate with any other without being compelled to use separate telephone systems. A consolidation will also eliminate any duplication in equipment which now exists. The commission's annual report dealing with the telephone situation shows that both systems are employed in 3.44 per cent of the residence stations and in 22.5 per cent of the business stations. It also indicates that 56,050 telephones belong to the Home system and 65,159 instruments to the Pacific system. The reason for setting the date of consolidation as 1916 is that the Pacific Telephone & Telegraph Company's franchise expires at that time.

Electrical Data Compiled by Chicago Department of Electricity

The department of gas and electricity of the city of Chicago now has nearly 450 employees and last year expended for various purposes $1,725,624, according to the annual report of Mr. Ray Palmer, commissioner of gas and electricity. Its revenues (inspection fees, receipts from construction work, sale of old material, etc.) amounted to $351,321, leaving a net cost of $1,374,303.

Under the jurisdiction of the department there were reported to be in Chicago 829 electric generating stations, of which 793 are isolated plants and thirteen are central-station plants. From these plants 53,891 arc lamps and 6,428,092 incandescent lamps are supplied. The central stations also supply electricity to motors having a total rating of 318,569 hp. The average rating of the motors inspected in 1913 was 6.8 hp. The number of electric signs inspected in 1913 was 7396, totaling 508,724 incandescent lamps, or an average of sixty-nine lamps to a sign.

There were 242 electrical accidents to persons during the year, and of these twenty-eight were fatal. The number of electrical fires in 1913 was eighty, the total loss being $34,403.

On Dec. 31, 1913, the city was operating from its municipal stations 17,493 arc and 3549 tungsten lamps for street lighting, and 282 tungsten lamps in railroad-crossing subways. The number of subway lamps has been increased largely since then. The city also rented 1056 arc and fifty-eight tungsten lamps from the Commonwealth Edison Company.

Mr. Palmer says that the average cash cost of operating and maintaining each city arc lamp was $31.32 per year. The total cost, including depreciation and investment charges, is estimated to be $56.13.

Convention of Edison Illuminating Companies

Brilliantly representative of the electric-lighting industry, the attendance of nearly 300 at the thirty-fifth annual convention of the Association of Edison Illuminating Companies, held at White Sulphur Springs, W. Va., Sept. 14 to 17, included a large number of the leading executives and engineers of the fields of both electricity supply and electrical manufacturing. Present as guests of the association to share in its valuable proceedings were also men of prominence in their lines associated with central-station work, and, following the departure in convention policy instituted several years ago, the 1914 meetings of the licensed companies were attended by invited representatives of the Westinghouse and other electrical manufacturing companies. Although the sessions themselves were held behind closed doors and the free discussion there indulged in by members remained strictly confidential, President Arthur Williams appointed a press committee to release for the benefit of the industry at large much of the invaluable information and data presented in the reports and papers. A number of ladies graced the convention and enjoyed the elaborate entertainment program of indoor functions and outdoor sports, the latter including golf, tennis, riding, driving, archery, etc., on the broad fields and wooded hills of the Greenbrier Hotel estate.

Tuesday morning's session was opened with the presidential address of Mr. Williams. He touched on the effect of the war in Europe in developing electrical and other industries of America and expediting industrial opportunities. Although in the industries human labor has already been almost entirely replaced by electric power, the fatiguing work of the home yet remains to be electrified to a corresponding degree. This substitution of electric for human power wherever possible in home work should be a primary and not a secondary consideration, declared President Williams. The important fields of the electric vehicle, electric ice-making and electrotherapeutic applications were also discussed briefly in the address, which closed with an appeal for broader education of the public in the uses of electricity in every department of human activity.

The report of the committee on the National Electrical Code was read, and Mr. S. G. Rhodes then presented the report of the committee on meters, alluding to several new types now being developed by the manufacturers. Prof. Elihu Thomson also spoke briefly, explaining his recent work on the design of a small commutator meter which it is hoped will cheapen the cost of small meters. A considerable portion of the meter committee's report was given over to the topic of maximum-demand meters and their proper selection for the service required. Several new demand meters employing thermal and electromagnetic principles will shortly be marketed, it was announced.

Employees' Welfare Topics

In a paper on "Workmen's Compensation" Mr. J. B. Murray discussed European and American employees' compensation laws and recommended the physical examination of employees as not only tending to reduce accidents to unfit workers but also speeding the recovery of those who have already suffered accidents.

At the first evening session Mr. Gerald Stanley Lee, author of the psychological study "Crowds," spoke on "The Changing Attitude of the Employer." Mr. Lee especially emphasized the growing interest of the modern employer in the men working for him, and their corresponding response in greater usefulness and increased productiveness. In their paper, "Safety in the Electric Lighting Industry," Messrs. J. L. Murrie and J. C. Robinson described the safety work of the New York Edison Company and pointed out the importance of the general health and welfare of the employee as a factor in eliminating accidents through improving the employee's alertness of mind and his clear-headedness. In any large group of employees a considerable percentage is, the report declared, in need of medical care without knowing it.

Report of the Lamp Committee

Of chief interest among the papers presented each year at the Edison conventions has come to be the report of the committee on incandescent lamps as read by its chairman, Mr. John W. Lieb. Among the interesting information contained in this year's report was an analysis of lamp manufacture in the United States which showed that 100,000,000 tungsten units are now produced annually in this country, whereas, exclusive of miniature lamps, only 3,000,000 tungsten lamps are being imported from abroad. In view of the European war, it is also significant that American lamp manufacturers find themselves practically independent of European raw materials. A curve also exhibited showed that had the early commercial tungsten lamps of 1907 been operated at specific consumptions close to 1 watt per cp, as are the present lamps, they would have had achieved lives of but 300 hours, whereas the modern units, burned at the same efficiency, show lives well above 1000 hours. Another table showed that the average variation in a well-made batch of tungsten lamps does not exceed plus or minus 5 per cent in candlepower and plus or minus 2½ per cent in wattage. Multiple-type gas-filled high-efficiency lamps are now being marketed in 200-watt and 300-watt sizes, the committee announced. These units consume approximately 0.75 watt per cp. Considerable laboratory and service data on the new gas-filled lamps were also presented. In the arc-lamp section of the report the statement was made that by substituting an improved electrode arrangement on magnetite lamps it had been found possible to effect an increase in efficiency amounting to 30 per cent. Spectro-photometric tests of artificial daylight equipment were included in the report, and adaptations of intensified-arc, tungsten and gas-mantle apparatus were displayed. For the projection of the lantern slides shown with the report a 110-volt, 20-amp gas-filled tungsten lamp was used in the stereopticon lantern. This lamp had a rated candlepower of 3500 cp to 4000 cp and provided illumination equal to that of a 30-amp arc lamp. A 12,000-cp "targon" incandescent unit illuminated the grounds in front of the hotel during the convention.

Mr. J. W. Cowles, chairman, presented the advanced progress report of the committee on street lighting, supplementing the first report, which was read at the recent National Electric Light Association convention in Philadelphia. In addition to the usual photometric tests a number of novel visibility and psychological tests have been applied to study the effects of surface irregularities and the presence of large objects on the street surface. The influence of different street-lighting systems on the mental state was also investigated. At the session of Wednesday evening Mr. W. D'A. Ryan delivered his lecture on the lighting of the Panama-Pacific Exposition, illustrating his remarks with lantern slides, sketches and models.

Hon. Edward E. McCall, chairman of the Public Service Commission of the First District of New York, spoke on "The Regulation of Public Utilities." A plan was also announced for a complete system of reporting the decisions of public service commissions.

A report of the closing sessions of the convention, together with the abstracts of the convention papers released for publication by the Edison association, will appear in a later issue.

Metallurgists Discuss the Use of the Electric Furnace for Brass Melting

At the annual convention of the American Institute of Metals, held in Chicago on Sept. 8-11, the interest taken in the possible use of the electric furnace for brass melting was shown by the fact that no less than five papers bearing on the subject were presented. One of these, read by Mr. H. M. St. John, of the Commonwealth Edison Company, Chicago, discussed "Electric Brass Melting from the Central-Station Viewpoint." This paper related to the cost of electrical energy for the operation of electric furnaces in brass foundries. At the rates of the Chicago company estimated costs were given per ton of metal melted, both for lift-out and tilting furnaces, for ten-hour, "special ten-hour," twenty-hour and twenty-four-hour operation. The "special ten-hour" plan is where sufficient energy is used during the night to keep the furnace hot. The twenty-hour plan contemplates the use of the off-peak schedule during the winter months. The author did not say that an absolutely reliable electric melting furnace was available.

In the discussion Mr. G. H. Clamer, of the Ajax Metal Company, Philadelphia, said that proprietors of small brass foundries could not think of installing electrical generating plants to supply energy for electric furnaces; they would be apt to buy the energy, if needed. The electric-service companies are greatly interested in this subject. It sounded like a foundryman's dream, said Mr. Clamer, to have the heat come into the establishment over a few wires. Mr. Frank Schutz, foundry foreman of the H. Mueller Manufacturing Company, Decatur, Ill., gave it as his opinion that it is only a matter of a short time when all brass founders will be using electric furnaces. He said that difficulties were encountered when the oil-fired furnace was first used, but these have been overcome. Similarly, the electric furnace will make its way.

A Government Expert's Favorable Report

The government Bureau of Mines is studying the metal losses which are encountered during the melting of brass and other non-ferrous alloys, in the effort to find methods of reducing these losses. Dr. H. W. Gillett is the alloy chemist of the Bureau of Mines, and he presented a paper on the subject "Melting Losses in Electric Brass Furnaces," prepared by himself and Mr. J. M. Lohr. In summarizing his investigations, Dr. Gillett said that unless the electric furnace can show a saving in metal losses in the melting of brass it will probably be a long time before it will be introduced. However, he expressed his belief that the electric furnace will reduce metal losses very materially. Indirect-arc furnaces cause local overheating, resulting in undue losses. Where the resistor is placed over the metal but where the heat is not concentrated, as in the indirect-arc type, better results are obtained. However, most of the work of the authors was done with crucible lift-out furnaces. The authors made many tests to determine if the use of the electric furnace resulted in cutting down metal losses in the melting of brass. The bulk of the work was done on brass having 16 per cent of zinc, which was poured at about 1200 deg. C. The net result was that it was found that the losses were reduced to one-half or one-third of what they would be in good practice with fuel-fired furnaces. Dr. Gillett remarked that to get good efficiency the electric furnace must be run pretty fast. In his judgment, it is going to pay the brass founder to buy electrical energy, because the resulting saving will show in economy. Co-operation between the founders, the electric-furnace builders and the central-station people is needed and is, indeed, in evidence. But it is to be remembered that the electric furnace of the brass foundry has not yet been sufficiently tested so that the savings mentioned in the paper may be obtained under foundry conditions. There is still much experimental work to be done. Manufacturers are wisely holding back electric furnaces until they are perfected. The advent of the electric furnace in the brass foundry will be slow but sure. However, it will never compete with fuel-fired furnaces where metals are now melted down without loss or with losses of less than 1 per cent. But where, as with many of the non-ferrous metals, the losses in melting are a large factor, the electric furnace gives promise of effecting a saving. In fact, the electric furnace in brass melting is no longer a wild hope, but may be regarded as a certainty.

Electric Brass Melting with the Hering Furnace

Mr. G. H. Clamer, of Philadelphia, gave, in brief abstract, a paper written by himself and Dr. Carl Hering on "Electric Brass Melting." The Hering furnace, sometimes called the pinch-effect furnace, was described. The authors believe that 10 lb. of metal can be cast for each kilowatt-hour input of electrical energy. It is calculated that a large saving will be effected by using the electric furnace. The furnace described will soon be in regular twenty-four-hour operation at the foundry of the Ajax Metal Company in Philadelphia. It is rated at 120 kw and operated by two-phase alternating current purchased from the electric-service company. Some difficulty has been experienced in getting the proper electrodes, but this trouble has been overcome.

The Arc Furnace

The paper by Mr. Ernest M. Schmelz, of Detroit, on "An Electric Furnace for Medium Temperature," was read by Secretary Corse. A recently patented improved Stassano arc furnace was described. Dr. Gillett said in the discussion that it was probable that greater uniformity of metal could be obtained by using the electric furnace than in the case of the fuel-fired furnace. One use of the electric furnace is in the melting of cathode copper as produced by electrolytic copper refining. While open to conviction, the speaker expressed himself as skeptical in relation to arc furnaces for melting iron and zinc. The arc-furnace people should produce their figures. As to frequency, Mr. Corse said that he understood that twenty-five-cycle energy was all right for melting copper. Mr. Corse added that he understood that Mr. N. Petinot, of Niagara Falls, one of the patentees of the furnace described by Mr. Schmelz, had had some trouble with the rapid destruction of his electrodes. Dr. H. G. Dorsey, of Dayton, said that so far as he had learned arc furnaces are not adapted to brass melting.

Helberger Furnace Said to Be a Failure

Dr. Herbert G. Dorsey, of the National Cash Register Company, Dayton, described a "Test on Electric Furnace for Brass Foundries." The furnace under test was that of the Helberger type, made by the Allgemeine company of Germany. Dr. Dorsey described the tests made with this furnace under operating conditions. He said the furnace was a failure. It might be used for work in laboratories of small size but was not a success as a foundry furnace. The speaker could not recommend it for commercial brass melting. Dr. Gillett said that this paper gave the first account of commercial work with the electric furnace in a brass foundry. Because the Helberger furnace did not succeed under the conditions of the work at Dayton, it does not follow that all electric furnaces are inefficient. Dr. Gillett also pointed out that in considering electric-furnace operation the energy needed to heat the furnace before work is begun must be taken into account.

Convention of Pennsylvania Electric Association

The seventh annual convention of the Pennsylvania Electric Association, state branch of the National Electric Light Association, was held at Forest Inn, Eagle's Mere Park, Pa., Sept. 8, 9, 10 and 11, the registered attendance being 286. The association was fortunate in having present during the convention the chief engineer of the Public Service Commission of Pennsylvania, the secretary of the commission and three other members of the engineering staff, who took part in the deliberations and, mingling with the various managers and operating men, obtained a clearer insight into the problems confronting central stations in Pennsylvania and how the companies are solving them. In addition, the association listened to an inspirational address from the Hon. Frederic W. Fleitz, who had much to do with the framing of the public utility law in Pennsylvania and who dwelt at some length on the merits and the future of regulation. For the guidance of member companies also, Prof. L. H. Harris, of Pittsburgh, consulting engineer for the Public Service Commission of Pennsylvania, sent a communication interpreting the various requirements of the commission and elucidating some points which in the working of the commission law proved to be obscure.

President's Address

Mr. Duncan T. Campbell, of Scranton, in his presidential address reviewed the year's work and urged the appointing of a general special committee with sub-committees representing the Pennsylvania Electric Association, whose duty it would be to meet with and confer with the Public Service Commission when called on. For the promotion of mutual confidence and welfare, this committee should have immediately available all data and information requested. President Campbell suggested that the sub-committees should have delegated to them some special branches of work, such as line construction, accounting, etc.

According to the report of the membership committee, the Pennsylvania Electric Association has now 1600 members as compared with 1367 a year ago. There are eighty Class A members, 1407 Class B members, twenty-eight Class D members, eighty-four Class E members and one honorary member.

Report of Accounting Committee

The report of the committee on accounting, of which Mr. H. R. Kern was chairman, contained a classification and description of accounts employed by electric-service organizations. The classification, which is intended to admit of practical and universal application, conforms quite closely with the practices and recommendations of commissions and other associations. The number of controlling or indicant accounts has been reduced as far as possible to make the classification applicable to both large and small properties. It was recommended that all companies, regardless of size, follow the controlling accounts, although only the larger organizations need employ the subdivisions. In general the accounts were divided into thirteen general classes, containing a total of 170 sub-accounts, some of which were further classified.

Safety and Welfare Committee Report

Conditions which tend to better the relations between an electric-service company and its employees will also improve the corporations' relation with the public. The report of the committee on safety and welfare, of which Mr. Henry Harris was chairman, indicated that 25 per cent of the member companies are engaged in welfare work. It also called attention to the work of various associations and societies along the same lines. The committee submitted a method of classifying accidents and emphasized the importance of securing such data in order that efforts might be made in the right direction to prevent repetitions of these accidents. By promoting the good health of employees it was pointed out that their minds would be kept alert and accidents prevented. An investigation made by this committee of various compensation plans in effect in Pennsylvania showed that employees can be liberally compensated during disablement not exceeding 261 weeks in duration at a cost of 2.75 per cent of the payroll. The employees' lives can be insured in proportion to their annual wage or salary at slightly over 1 per cent of the payroll. Compensation and insurance can be provided still more inexpensively by establishing mutual-risk organizations. Service annuities based on payments of 1 or 2 per cent of the wages for each year's service can be maintained for 1 or 2 per cent of the payroll. Suggestions were also made for conducting savings and loans bureaus and providing vocational education and opportunities for physical improvement.

Discussion

Messrs. W. H. Johnson of the Philadelphia Electric Company, E. H. Davis of the Lycoming Edison Company of Williamsport, and M. G. Kennedy of the United Gas Improvement Company of Philadelphia took part in the discussion on the report of the safety and welfare committee. The desire was expressed to have the committee submit a plan in detail in keeping with its recommendations as made in the report, and the discussion indicated that the member companies are beginning to appreciate the value of welfare work among their employees and are prepared to extend their present efforts in that line.

Lighting of Interurban Highways

The type of equipment employed by the Harrisburg (Pa.) Light & Power Company to light interurban roads and the cost of installing this equipment were given in a paper on "Interurban Lighting" by Mr. R. W. Hoy. As poles have to be erected to support the wires feeding the road lamps anyway, the author suggested that with very little more expense additional conductors can be strung on the same poles and business solicited from persons living along the highway. A combined highway-lighting and service circuit for supplying energy to persons living on the right-of-way was constructed by the Harrisburg company at a cost of $933,62 per mile, including material and labor. A single-phase, 2300-volt circuit supported on 35-ft. poles spaced about 120 ft. apart was employed. Twenty-one 100-cp nitrogen-filled lamps equipped with shades and prismatic refractors were used per mile. The erection of ten-mile sections reduces the cost of installation to $901.16 per mile.

Meter-Testing and Voltage-Regulation Requirements of Commission

In his paper on "Requirements of the Public Service Commission Covering Meter Testing and Voltage Regulation," Mr. E. H. Tyson interpreted the rules of the Pennsylvania commission regarding the testing of meters and regulation of voltage. He suggested that a company should subject meters made by several different manufacturers to a test as prescribed in the "Meter Code" before adopting any type of instrument as standard. Methods of filing meter-test records and description and illustrations of forms on which to keep data were given. The author pointed out what characteristics should be required in primary standards and discussed the care and use of rotating-element and indicating instruments used for meter testing. The equipment of a laboratory in which to conduct tests was also described. In closing the paper, the author

said that the commission rules regarding voltage regulation are reasonable and should necessitate no changes in the operation of an up-to-date utility.

Discussion

The paper was discussed in a general way by Messrs. P. H. Bartlett of Philadelphia, G. E. Wendle of Williamsport, A. W. Burke of Wilmington, E. H. Davis of Williamsport, M. G. Kennedy of Philadelphia, E. D. Dreyfus of Pittsburgh, and F. M. Noecker of Renovo. The consensus of opinion was that standard records are desirable and that the association should confer with the commission as to their form.

Interpretation of Public Service Law

Prof. L. H. Harris, of Pittsburgh, consulting engineer for the Public Service Commission of Pennsylvania, was unable to be present, but sent a communication answering the various questions which had come up before the commission during the year. The rules were reduced to simple terms and commented on. Among the suggestions made by Professor Harris were the following: that the Pennsylvania State Association get up a standard card-record system for meters tested, and that in view of the large variety of lighting contracts existing between corporations and municipalities and of the standard service rendered a standard form of contract be got up for municipal street lighting. The suggestion was also made that better bookkeeping systems be used so as to enable the companies to get at the actual costs of various classes of service. He urged the frequent use of graphic instruments so as to show the voltage variations in various sections of the systems.

Immediately following the reading of Prof. Harris' communication, Dr. Herbert Snow, chief engineer of the Public Service Commission, made an address in which he urged the appointing of an engineering committee whose duty it would be to confer with the commission on all engineering questions pertaining to the lighting industry. Mr. George Wilson, who has charge of all rate matters coming before the commission, and Mr. A. B. Millar, secretary of the commission, also spoke.

Mr. Holton H. Scott, president of the National Electric Light Association, being unable to attend the convention, Mr. S. A. Sewall, assistant secretary, extended the greetings of the national body and made a plea for increased membership in company sections. He also dwelt on the usefulness of the "Question Box" and asked the hearty co-operation of all members of the association in contributing to this department of the *N. E. L. A. Bulletin.* Mr. G. B. Muldaur told of the work done by the Society for Electrical Development, which now has 1400 members.

Public Utility Interconstruction

At the executive session on the afternoon of Sept. 10 Mr. E. H. Davis, reporting for the committee on public utility interconstruction, told of the action taken at the Philadelphia convention of the National Electric Light Association in eliminating from the overhead-line specifications all references to voltage limitations, and said that the committee of the American Electric Railway Association had pursued a similar course. He submitted the new joint-pole agreement which the Bell Telephone interests are asking the electric-light companies to sign, and said that the member companies in Pennsylvania had found it undesirable to sign the agreement.

Commission Regulation

Hon. Frederic Fleitz, in an address at the executive session, told of the advantages of the get-together spirit manifested in the convention of the Pennsylvania Electric Association, especially to the men of the smaller plants who are necessarily shut off from daily contact with the other members of the profession and hence do not have the advantages of frequent consultation and advice. He reiterated that regulation by commission is here to stay, and said that it should be a matter of public concern that the commissioners themselves should possess intelligence, tact and be men of sterling integrity. The Pennsylvania Commission law, he maintained, was the most drastic in the United States because of its completeness and its thoroughness. General Fleitz showed the distinction between a natural consolidation based on economic considerations and an unnatural consolidation brought about by competitive conditions. Regulation, he said, is predicated on monopoly. The most important question now before the country, according to General Fleitz, is the question of rates, and he maintained that it is a mistake to try to simplify schedules too much. There is a difference in service as to cost, relation to peak, continuity, regularity, etc., and special rates applying to special service can be justified by law. He spoke of the necessity of watching all decisions of the commission, whether they apply to the electric lighting industry or not, since the germ of a principle enunciated in any regulatory matter is applicable to the electrical industry as well. He suggested that the lighting companies make every effort to win public confidence by being honest, frank and fair to their patrons. A company possessing the confidence of the public will seldom have occasion to appear before the commission. The lighting companies should also possess the confidence of the commission. If commission regulation fails, municipal ownership will follow and bring with it repression. Contrasting the municipally owned utilities of Europe with the privately owned utilities of the United States, General Fleitz said if a change of the latter to the former is made it will be a blight on the development of American progress.

Methods of Securing and Value of Small-Residence Consumers

Aside from the direct financial gain secured through small consumers' business, it has been noticed that persons of the middle class are automatically attracted to the use of electricity on seeing their poorer neighbors employ it. In the paper on "Securing the Small-Residence Business," by Mr. E. W. Osborne, it was pointed out that to make small-residence consumers profitable business should be secured on existing lines at a flat rate. The author suggested charging 1 cent per watt per month. Special inducements, such as premiums, are also effective in securing this class of business. It was further recommended that contractors be induced to quote a flat rate per outlet on small installations. Carefully prepared newspaper advertisements, solicitation, courtesy, enthusiasm and service were also suggested as being effective in obtaining small consumers.

Discussion

Mr. E. B. Greene, of Altoona, said his experience did not differ from the author's. His company starts a flat-rate campaign every fall and the change from a current-limiting device to meter is made in order to enable the use of heating devices. The Tuesday day ironing load in Altoona is 1400 kw greater than the Monday load.

Flat-Rate Meters

In a paper by Mr. H. F. Hatch, of Wilmington, Del., dealing with flat-rate meters for heating and lighting loads, the author rehearsed the unsatisfactory experience of the central station of Wilmington with current-limiting devices. These current-limiting devices were

finally discarded and all customers placed on a meter basis. There is at present in use on certain motor circuits in Wilmington an excess watt-hour meter. This comprises a standard watt-hour meter, a ratchet device to prevent negative registration, a small shunt transformer, and a compensator consisting of a special series transformer with a saturated core and an adjustable resistance. The special transformer used in Wilmington takes less than two watts from the line, although a standard bell-ringing transformer can be used. The object of the meter is to allow a predetermined load to pass through the instrument without recording, all excess beyond the predetermined load being indicated. The meter contains no contact-making device; its operation is noiseless and the cost of the attachment is slight. It was suggested that a meter of this type might be used in place of a current-limiting device because it possesses all the advantages of the latter, enables excess energy to be used when desired by the consumer, and does not entail the installation of an entirely different instrument should a customer desire to change from a flat rate to a meter basis.

Discussion

A rather spirited discussion followed the presentation of the paper, Messrs. A. T. Holbrook of Pittsburgh, H. H. Ganser of Norristown, R. W. Hoy of Harrisburg, E. W. Osborne of Scranton, J. W. McKelvie of Pittsburgh, F. M. Noecker of Renovo, P. H. Bartlett of Philadelphia, M. H. Watkins of Mount Carmel, W. L. Loeb of Pittsburgh, and A. W. Burke of Wilmington, Del., taking part. The manufacturers of current-limiting devices told of the advantages of these instruments and maintained that the experience of the Wilmington company with a limited flat-rate system was not the experience of other companies and that the contention of the author that flat-rate business is undesirable to the customer and central station alike was refuted by Mr. S. E. Doane, in his paper before the recent convention of the National Electric Light Association, and could also be refuted by members of the Pennsylvania Electric Association using a current-limiting device. According to Mr. Holbrook, more central stations in Pennsylvania have adopted a flat-rate system than in any other state in the Union. Messrs. Hoy, Osborne and McKelvie defended the use of current-limiting devices and told how widely they were employed by their respective companies. Harrisburg has 800 in use, Scranton 3500, and Pittsburgh 4000. The system of charging appeals particularly to foreigners, and by means of the current-limiting device business otherwise not procurable can be obtained. The revenue is on a par with that received from meter customers. In a town of 6000 connected to the Scranton system 1200 customers are fed through current-limiting devices. The rate is $1.25 a month, or about $120 a kw-year. The Duquesne Light Company has a gross income of $70,000 a year from flat-rate business, and tests indicate that the rate for energy varies from 2.3 cents to 7 cents per kw-hr.

Insulator Design

A paper on "Insulator Design in Relation to Lightning and Other Static Disturbances" was prepared by Mr. A. O. Austin, of the Ohio Brass Company. In it the author referred to a large system with moderate rating and small conductors and showed how such a system can withstand surges from switching and arcing grounds better than a large system backed by large power houses and conductors. The latter system should be equipped with insulators commensurate in size with the size of the load and its importance. He suggested that inasmuch as surges affect the insulators more than lightning, interconnected systems can obtain some measure of protection and be enabled to localize trouble by using steel conductors in tying in the various branches of the system, thus increasing the impedance and lessening the disturbances caused by surges. Routine tests are preferable to design tests, and according to the author there is a growing tendency to discard the oil puncture test and give more attention to routine tests which eliminate all the weak members. The manufacturers have brought out a better design of insulator providing more strength to resist thermal stresses set up by uneven heating or by cement expansion, which tends to crack the insulators in time. This cracking may so weaken the insulator that the slightest surge causes trouble.

Election of Officers

At the final session, on the recommendation of the nominating committee, the following officers were unanimously chosen: President, Mr. Walter E. Long of Philadelphia; vice-president, Mr. Stephen C. Pohe of Bloomsburg; secretary-treasurer, Mr. H. N. Müller of Pittsburgh; members of the executive committee for two years, Messrs. W. R. Kenney of Connellsville, H. Harris of Wilmerding, and J. S. Wise, Jr., of Hazleton; member of the executive committee for one year, Mr. F. M. Noecker of Renovo.

W. E. LONG

Mr. Walter E. Long, the newly elected president of the Pennsylvania Electric Association, was born in Philadelphia, Pa., Aug. 16, 1879. He started his business career at the age of fifteen in the iron and steel business, with the Cambria Steel Company and the American Bridge Company. Ten years ago he resigned his position as assistant statistician of the American Bridge Company and entered the employ of the Philadelphia Electric Company, in the accounting department. He was advanced to the position of assistant auditor and about four years ago assumed his present position as assistant to the first vice-president, Mr. W. H. Johnson. Mr. Long has been connected with the Pennsylvania Electric Association since its inception. He was elected secretary-treasurer in 1910, and served as such until last year, when he was elected vice-president. Mr. Long has been largely instrumental in the marvelous growth of the Pennsylvania branch of the National Electric Light Association. He is a member of the National Electric Light Association, the Illuminating Engineering Society and the American Statistical Association.

Domestic and Foreign Trade Conditions

Statements from Electrical Interests Show the Steps Taken to Minimize Industrial Effects of War and Promote Normal Activity

MR. J. G. WHITE ON WAR RESULTS

Conditions of London House Improved Over Situation After Beginning of Conflict

Mr. J. G. White was asked by the *Electrical World* for a statement in regard to the direct effects of the war upon the affiliated London house of J. G. White & Company, Ltd. The London house conducts all of the business of the organization in South America and the Orient and, in fact, in all parts of the world excepting North America, Cuba, Central America and the Philippines. The business in North America is conducted by J. G. White & Company, Inc., of New York. The London house was established in 1900. It is connected with the New York organization through the fact that Mr. J. G. White, the active head of the organization in this country, is the largest stockholder of the English company. Since the London house was established, while it has operated in Great Britain, Australia and New Zealand, India and various other parts of the world, its business recently has been mainly in South American enterprises of the kind that have been financed principally in England.

Mr. White said that general business conditions, so far as the London house was concerned, have improved over the situation just after the beginning of the war. Necessarily the operations of the London house have been curtailed to some extent. Work on some of the enterprises in which it has engaged has been deferred until after the close of the war, but on others steady progress is still being made. Mr. White said that Great Britain has largely restored normal facilities for overseas shipments and that advices have been received from the London house that English manufacturers are prepared to make prompt deliveries of all of their usual products. The London house is prepared, notwithstanding the continuation of war, to procure and ship promptly, subject to government exemptions and restrictions, any materials or supplies that can be secured in Great Britain or any of the countries with which that nation now maintains commercial relations.

Regarding American business, Mr. White stated that financial conditions preceding the declaration of war were unfavorable to the undertaking of new enterprises, and that these conditions have been tremendously emphasized by the war, with the result that very little new engineering or construction work is proceeding. At the moment the most active part of the J. G. White Engineeering Corporation is understood to be its purchasing department. Recently important purchasing commissions have been received from Porto Rico, Cuba, the Philippines and other parts of the world. This department undertakes commissions to purchase in America any kind of machinery, materials or supplies for clients in the United States or, in fact, in any part of the world. This department does not attempt to secure orders which otherwise might go to its allied London company or others in Great Britain, realizing that it is of primary importance, and believed to be for the best interests of the world, that the industrial population there should be kept employed so far as is possible. On the other hand, the department takes orders from any part of the world for any purchases, whether emergency or usual, which existing world's conditions make it advisable to procure in the United States.

OPPORTUNITIES TO EXTEND OUR EXPORTS

American Electrical Productions Have Excellent Reputation, but Knowledge of Export Conditions Is Needed

BY FRANCIS B. CROCKER

In May, June and July of 1889 the writer contributed a series of articles to the *Electrical World* on the "Electrical Trade Conditions in the Far East," including India, Japan and China. The ideas expressed in those articles were gathered during a trip around the world. A second series of articles on this subject were contributed by the writer to the *Electrical World* during March and April, 1910, following a second globe-circling tour.* Both series of articles were from the point of view of American trade possibilities in electrical lines.

Most of the present attention to American export development has been directed toward South America, which undoubtedly presents great opportunity. The writer is not familiar with South America, but he has had personal experience and has given much thought to the Oriental conditions, also to those existing in the West Indies. It is timely, therefore, to call particular attention to the fact that the field for American electrical trade in those directions is also very large.

Excellent Reputation of American Goods

Electrical machinery, supplies, etc., of American manufacture already have a most excellent reputation throughout eastern countries and in the West Indies. It is no boastful exaggeration to say that the superiority of American goods of that kind is generally admitted. What prevented or interfered with the larger sale of our products was, first, the low prices quoted by German and English competitors, and, second, the long credits of six months or a year which are, or were, given to their customers by European manufacturers. Such long terms for payment are not customary in American business. During the present war, and probably for some time afterward, the German, English and other European manufacturers will not be able to supply the goods. There seems to be every prospect, therefore, that American electrical products of all kinds, having a first-class reputation already established, will be bought, almost to the exclusion of non-American competition, on terms reasonably suited to American conditions and customs. Not only have American electrical productions acquired the very best reputation, but our manufacturers—for example, the General Electric and Westinghouse companies—are already well represented by local agencies or branch offices in charge of experienced business men and engineers fully competent to handle the trade immediately and effectively now that the bugbear of European competition is eliminated.

Europe's Better Prices and Longer Credits

The writer knows of many actual cases where much electrical apparatus was bought from German and English sources simply because of better prices and longer credits. The total volume of the electrical business done by German, English and other European manufacturers is very great; for example, the Allgemeine Elektricitäts and Siemens-Halske companies had total sales of almost $180,000,000. It is generally true of German

*As Oriental conditions do not change rapidly, these observations are still timely.—EDS.

manufactures that 80 per cent of them are exported and only 20 per cent used at home. This does not hold good in the electrical business, but the fraction of such goods sold abroad is a large one. Actual statistics show that Germany's electrical exports were at the rate of about $70,000,000 per year for the first half of 1914. Large exports of electrical goods were also made by other European manufacturers. Of course, the war will produce financial conditions all over the world that will partly paralyze trade. Nevertheless, affairs will not stand still in all countries, and there is certainly an opportunity for America to secure what business there is, thereby occupying a field which she should continue to hold when business revives, however slowly or rapidly that occurs after the war is over.

Our Small Export Trade

To illustrate how very different conditions have been heretofore in this country compared with those in Germany, it is interesting to note that the United States has been exporting only about 10 or 15 per cent of its manufactures, the rest being used within itself. Hence we see that the export trade of the Germans has amounted to 80 per cent and was therefore of predominant importance, while it has been a mere incident in the United States, being only 10 per cent or thereabouts. In foodstuffs American export has been relatively larger than in manufactures, but it is only a small fraction of the total production. For example, only about 25 per cent of the grain that we raise is shipped abroad, and a still smaller proportion of other food produce is exported.

While American electrical products have already gained a first-class reputation and the two large companies are already established in many Oriental cities, the fact remains that Americans in general have had little experience and correspondingly little knowledge concerning export business. The mere sending of traveling salesmen, equipped with photographs, is absolutely futile in dealing with the ultra-conservative Asiatic, or even West Indian. It is necessary to have, first, personal representation on the spot, maintained sufficiently long to become well established locally and obtain the good will and confidence of the customers, which is a slow process in those countries. Second, the representative must have the experience and temperament to deal with and humor the peculiarities of the Oriental mind or the Spanish-American mind. American natural-born tendencies and our whole business training are exactly in opposition to their points of view.

Fortunately, the American consular service is largely composed of intelligent and energetic men who have gained their positions by passing severe competitive examinations. Judging from personal experience with dozens of our consular officers, they are well acquainted with the conditions existing in their respective cities and countries. This omnipresent consular service is not only ready but anxious to render much assistance in starting and developing American export trade.

Obstacles Being Overcome

Newspapers and politicians, whether from ignorance or because there is some axe to grind, have talked a great deal about the lack of merchant ships to carry American exports abroad. Of course, it is true that there are very few vessels flying the Stars and Stripes that are engaged in foreign trade. Nevertheless, there are plenty of available merchant vessels under the flag of Norway, Sweden and other neutral countries, and still more under the flags of Great Britain and France, that can be chartered for carrying American grain and other products abroad. Moreover, the freight rates, while they have increased considerably, are not much higher now than they were two years ago and are not at all prohibitive. Considering the higher prices obtained for our grain and other commodities, the prices far more than offset the increase in freight. In short, the scarcity of ships is not now acting as a serious handicap in maintaining or extending American export trade. The real and very serious difficulty is the present chaotic condition of international banking and exchange. This condition will gradually improve as methods are devised and put in operation for handling these important matters.

BUSINESS OUTLOOK FOR MANUFACTURERS

Opinions from Various Branches of the Industry Show Reasonable Confidence

Replying to the request of the *Electrical World* for opinions as to the effect of the war on business, manufacturers have expressed opinions as follows:

Believe Financial Condition Will Improve

Mr. H. T. Dyett, treasurer Rome Wire Company, Rome, N. Y.: "All lines of business have been more or less upset, and it is difficult even now for our customers or ourselves to look forward with any degree of certainty for more than a few weeks at a time. Finances seem to bother some of our customers, but we believe that conditions will steadily improve in this respect. August orders with us have been quite satisfactory, and in our most important department we are running full time and are several weeks behind our orders. We hardly think this reflects general conditions in our line of business, however, as we know that many of our competitors are exceedingly slack. Orders received during the past week were better than during the first or second week in August. If the wise measures taken by the administration and by our bankers meet conditions this fall and money becomes a little easier, we look for increased business in many lines. Two of the world's largest electrical manufacturers situated in Germany, whose sales amount to $170,000,000 per year, cannot fill their export orders, and this business should naturally come to America. We have had many inquiries during the past two or three weeks from all parts of the world and believe this an opportune time to establish an export trade. It should be borne in mind, however, that the amount of export business we can get is small as compared with our own business in the United States. We are operating somewhat better than sixty hours a week on an average in all departments, with our normal number of employees, both in the factory and in our office. While we are dependent to a certain extent upon the Far East for rubber, Germany for dyes and Austria for wax, yet our requirements, we believe, are fully covered, and we do not anticipate any cessation of manufacturing in our plant due to lack of raw materials."

Effect on Platinum

Mr. A. M. Williams, Baker & Company, Inc., Newark, N. J.: "The chief source of platinum production being in Russia, the European war has had an important effect on the platinum industry, the extent of which will be naturally somewhat dependent on the duration of the struggle. At present all marine shipping has been badly crippled, and, owing to the increased cost of transportation, insurance, war risk and exchange, prices have advanced materially (approximately from 10 per cent to 15 per cent on all platinum productions). There are many demands for platinum which hardly permit of a substitute, owing to the peculiar and noble qualities of the metal, and in some instances where manufacturers

have attempted to make use of a substitute the results have been found unsatisfactory. We cannot at this time forecast how serious the situation may become, as there are so many factors which will affect matters one way or another. But for the present our stock is such that we are in a position to fill our customers' reasonable requirements."

Developing Export Trade

Mr. Ronald Crawford, vice-president Oven Equipment & Manufacturing Company, New Haven, Conn.: "Our export business is limited. We feel, however, that we should obtain considerable business with South American countries in the near future. The difficulty, however, seems to be from the lack of direct banking facilities with the United States. Most of the inquiries that we have received from South American countries have stated that payment would be made through their English or German banks, and when we asked for payment through their branches in the United States the sale usually fell through. Our business is being affected at the present time by the European war, probably through the hesitation of manufacturers in extending their business. We are taking steps at the present time to develop our export trade, especially with South American countries. We are not dependent on European countries to any extent for raw materials. Mercury happens to be one of the materials which we call to mind at this time. The quantity used is not important, and we understand it is obtained in California in limited quantities."

Increased South American Trade Expected

Mr. Charles P. Roundy, Hope Webbing Company, Providence, R. I.: "Our export business is a very small part of our total, and the war should hardly inconvenience us in this respect. There will undoubtedly be increased demands from South America and other countries which we would suppose would offset any reduction in the call from European countries. Our domestic business should hardly be injured, except as probable difficulty in raising capital will retard extensions. We have not changed our organization materially with regard to either domestic or foreign trade, nor have we ever been dependent upon European countries for such raw materials as are used in the electrical department of our business."

Somewhat Conservative Basis

Mr. J. F. Selby, Beardslee Chandelier Manufacturing Company, Chicago: "Inasmuch as we do practically no export business and buy very little material from the European market, we are not in a position to answer most of your questions. It is to be expected, we believe, that domestic purchases will be made on a somewhat conservative basis under existing conditions, which will probably prevent the increase in sales we might expect were conditions normal."

War Felt to Some Extent

Mr. M. P. Maxwell, sales manager for Messrs. Hickey & Schneider, New York: "We have been very much interested in the articles appearing in the *Electrical World* issues recently setting forth some of the effects of the war upon the electrical industry. We have felt the effect of the war to some extent, owing to the fact that we have been working on several new propositions that would no doubt have taken definite shape by this time and have placed in our hands orders that would have necessitated increasing our working force and covered two or three months' work. We cannot say that we have felt the effects of the war to any great extent as regards our regular standard material, which embodies mostly lines that have been built for some time past and extensions that are going on just the same as heretofore. We do not depend upon European countries for raw materials to any great extent, and therefore we feel no effect this way, except through some of our sources of supply that have found an excuse for advancing prices. We anticipate an increased demand for our materials from South American and other countries. Probably the reason for our not feeling the effects of the war more seriously at this time is our having received several large orders prior to the time war was declared which have not been canceled or held up, and our customers will doubtless receive the benefit inasmuch as we shall be able to make better deliveries than we anticipated, owing to our being able to use our entire force on these orders alone."

SOUTH AMERICAN TRADE OUTLOOK

National Foreign Trade Council Says Business Men and Government Must Co-operate on a Definite Policy

To correct misconceptions regarding trade with South America and opportunities for its extension, the National Foreign Trade Council has issued a statement calling attention to certain fundamental conditions surrounding that trade which must be improved in order to accommodate existing trade, to say nothing of future business.

At the outbreak of the war a standing committee of New York members was appointed to consider foreign trade problems. As a result of the committee's observations a statement has been issued which follows in part:

Trade Independence Vital

"Our greatest opportunity lies in the establishment of those direct financial relations and the American steamship connections necessary to assure the economic independence of the trade we already have and of that which we hope to gain. With increased banking and steamship facilities of our own it should be possible to pay for a greater proportion of our imports in merchandise of our own production and to retain in the United States a greater proportion of the funds due for imports.

"While individual opportunities will offer themselves to our exporters, the general security and prosperity of the South American trade can be guaranteed only by the formulation of a definite policy upon the part of business men as well as the government and by co-operation among all elements. Increased South American trade founded on anything less substantial will remain vulnerable to the changing fortunes of European finance and business."

ENGLAND SEES TRADE OPPORTUNITY

Board of Trade Issues Pamphlet to Assist Electrical Manufacturers in Extending Foreign Business

The London Board of Trade has issued a pamphlet to assist electrical manufacturers in quickly extending their foreign and colonial export trade. Particular comment is made on the South African trade, which in 1913 was $2,525,000 from the United Kingdom and $2,050,000 from Germany and Austria. England was foremost in all articles but machinery, in which Germany practically doubled her. Emphasis was laid on the fact that English manufacturers had been in the habit of rating their goods too high. Also it is said that foreign merchants by carrying good stocks and making prompt deliveries to the mines have been even more successful than the British firms.

PUBLIC SERVICE COMMISSION NEWS

New Jersey Commission

The Board of Public Utility Commissioners of New Jersey has dismissed the complaint of Mr. Joseph B. McBride, Hoboken, against the Public Service Electric Company, in which it was held that the company should provide necessary service switches and cut-outs, and also that ground connection as installed by the company was not of the size called for in rules governing such installation. In its decision on the first point the board holds that necessary service switches and cut-outs within the building are part of the building equipment and form no part of the installation which must be furnished at the expense of the company. In this the board states that the wiring inside of a building is as much a part of the building as is the piping required for the distribution of gas or water.

On the contention of proper ground connections the board renders the following decision: "The question arises as to the reason for making the ground wire larger than the service wire, as will be the case where a No. 10 or No. 8 service wire is in use. There appear to be two reasons for providing a ground wire as large as No. 6 where the service wire is smaller: (1) for purely mechanical considerations to protect against an interruption, and (2) because in case of a rush of current which would be sufficient to fuse any portion of the circuit the service wire would be interrupted first, without causing a break in the continuity of the ground wire itself. Therefore the ground wire referred to in the National Electrical Code, Rule 15, includes only so much of the ground circuit as extends from the main service cut-out to the point where attachment is made to the water pipes. For these reasons the complaint is dismissed."

California Commission

The Railroad Commission has rendered a decision reducing the general lighting rates charged by the Coast Valleys Gas & Electric Company in the city of Salinas, Monterey County, from 10 cents for the first 50 kw-hr. to 8 cents for the last 20 kw-hr. The commission also fixed a minimum meter charge of $1 per month and a service charge of $1. The latter charge will be required of all applicants for service but will be refunded if the consumer remains for twelve months in one location.

The rates for municipal street lighting were also declared to be excessive. Henceforth the city will pay 10 cents per year per watt connected instead of the present rate of $7.50 per month for each arc light. The commission made no changes in motor-service rates but established a rule that the consumer should have the option of combining power of less than 3 hp with lighting at the lighting rates or of requiring separate motor-service and lighting meters for each class of service. The company received the privilege of supplying either single or three-phase current to motor installations of less than 3 hp.

Ohio Commission

Messrs. Nau, Rusk & Swearingen, public accountants of Cleveland, have submitted to the commission a system of accounting for utility companies. The plan covers all sizes of plants. The companies may keep any other accounts desired, either for the purpose of recording other ideas they may wish to preserve or explanatory of the figures contained in the fixed system of accounting.

The system contemplates the division of properties into four general classes. The smallest class, D, includes all those companies having an annual operating revenue of $5,000 or less; class C comprises those having an annual operating revenue exceeding $5,000 but not more than $25,000; class B, those having a revenue of over $25,000 but not exceeding $75,000, and class A all those whose annual revenue exceeds $75,000. Any company may use the system prescribed for the next higher class and may subdivide the accounts, as given in the system, to any extent that may best suit operating conditions.

When the system is printed it will be distributed to all the companies interested for their suggestions and criticisms. At present the plan is in tentative form.

This system will provide for municipally owned as well as privately owned plants. In applying the plan to municipal plants, the city owning a plant will be charged with an investment which will compare with the stock of a private corporation. An accounting will be made for a return on this. Accounts will also show the free service rendered and the free service received in the same manner as if such services had been sold or purchased. Taxes also will be shown, as if the plant were paying the same rate demanded of a private corporation. A balance sheet will be prescribed.

New York Commissions

The Second District Commission has granted permission for two extensions of its plant and the exercise of two new franchises by the Central Hudson Gas & Electric Company, one in the town of Wappingers, Dutchess County, and the other in the town of Hamptonburg, Orange County. In the case of the extension in Dutchess County the commission allows the new extensions only where they do not interfere with the already established business of supplying electrical energy to the public by the Garner print works and bleachery in Wappingers Falls, Hughsonville and certain other communities in the southwestern part of the town.

Current News Notes

BURNING YOUR BRIDGES, AND THE ENEMY TOO.—Reports from Petrograd, the renamed capital of Russia, declare that the Germans when retreating mine the bridges in such a way that the weight of a large body of pursuers, by causing a depression of the bridge, brings wires into contact, completing an electric circuit which sets off powerful explosives and blows up the structure. This and other electrical devices have been used by the Germans to advantage in the present conflict.

* * *

JOVIAN DISPLAY AT TENNESSEE STATE FAIR.—The entire lower floor of the Agricultural Building at the Tennessee State Fair to be held at Nashville will be occupied during fair week by an elaborate electrical exposition which is to be arranged and conducted by the Jovian League of Nashville. An extensive demonstration of household electrical appliances will be made to show the public that electricity is available for use at moderate rates. Semi-indirect lighting fixtures will be employed and an electric fountain is projected. The Jovian committee which is working out the details of the exhibit is composed of Messrs. James A. Cayce, chairman; J. P. Lawrence, of Herbrick & Lawrence; James Shingleton, Nashville Machine Company; J. W. Pentecost, Municipal Lighting Company; J. E. Carnes, sales manager of the Nashville Railway & Light Company; J. P. W. Brown, superintendent of the Nashville Railway & Light Company, and Robert C. Leonard, statesman of the Jovian Order.

PROPOSED ELECTRIFICATION OF CAUCASUS RAILROADS.—A committee of Russian railroad men, headed by M. Vosnejienski, has been in the Caucasus investigating the water-power available to furnish electricity for the operation of the government and private railroads of that region, which are now operated by steam.

* * *

MUNICIPAL PLANT AT SOUTH STILLWATER TO BE SUPPLIED FROM CENTRAL STATION.—Following the recent destruction by fire of the municipal electric plant at South Stillwater, Minn., the village authorities have entered into a fifteen-year contract with the Consumers' Power Company which provides for the purchase of electricity for street lighting, water-works pumping and commercial and domestic use. The village will distribute the energy over its own lines.

* * *

ELECTION IN COMMONWEALTH EDISON COMPANY SECTION.—The election of officers of the Commonwealth Edison Company Section of the National Electric Light Association in Chicago is proceeding by letter ballot. There appears to be no great opposition to the "regular" ticket, and it seems likely that the men on this list will be elected. The list is as follows: President, Mr. George B. Foster, assistant to vice-president; vice-president, Mr. J. T. Mountain, assistant to chief operating engineer; secretary, Mr. R. H. Williams, assistant auditor; treasurer, Mr. William A. Fox, vice-president.

* * *

PORTLAND (MAINE) COMPANY'S OFFICE STAFF HOLD OUTING.—An all-day outing was given to the entire office staff of the Cumberland County Power & Light Company, Portland, Maine, on Aug. 28 by Mr. A. H. Ford, the manager. Delegates from Portland and Biddeford left Portland in the morning on the Lewiston, Augusta & Waterville Street Railway and were joined at Lewiston by the rest of the party. From that city the excursionists rode to Tacoma Inn (about 16 miles from Gardiner, between two lakes), where they enjoyed a shore dinner, music, boating, baseball games, etc. In the afternoon the cars were boarded for Gardiner, where a boat was waiting to take them to Bath, a sail of 25 miles down the Kennebec River. Arriving there, the party returned to Portland on interurban cars.

* * *

THUNDERSTORM DETECTOR TO WARN OF INCREASED DEMANDS.—An electrical device which will indicate the approach of a thunderstorm several hours before any clouds appear is being used successfully by an electric-service company in New York City to give ample time to provide for increased illumination when the thunder clouds darken the sky. The storm-detector apparatus, which resembles wireless receiving equipment, is operated by faint impulses from electrical disturbances in the vicinity. Receiving antennas intercept the impulses, which cause a relay to close an alarm-bell circuit. At first the signals are far apart, but as the electrical disturbance approaches the bell rings more frequently. From an hour to half an hour before the storm breaks, depending on the intensity thereof, the bell will ring continuously. In the meantime steam may be raised to operate generators which are placed in readiness to supply additional energy when the demand increases.

* * *

FIRST LUMBER MILL IN OREGON TO BE ELECTRIFIED.—The new Booth-Kelly lumber mill which has been completed recently at Springfield, Ore., is the first sawmill in that State to be operated by electricity. The inauguration of electric drive at this mill was considered such an epoch in the lumber history of the State that the people of the locality celebrated the event with a parade. Mill Day was heralded by the distribution of four-page folders describing the mill equipment. The plant is designed to handle 150,000 ft. of lumber in a ten-hour day. Sixty-five motors, ranging from 0.5 hp to 350 hp and totaling 2150 hp, are installed. Lumber for the kilns is piled by an automatic stacker; lumber is conveyed about the yards by monorail cars or trucks hauled by electric tractors, and heavy timbers are handled by machinery instead of men. Energy for operating the mill is furnished by the Oregon Power Company. All refuse from the mill is delivered to the central station for firing the boilers.

* * *

SOCIETY MEETINGS

NO CHICAGO SHOW THIS YEAR.—Announcement is made by the Electrical Trades Exposition Company that this year's Chicago electrical show, which was scheduled to be held in that city from Oct. 31 to Nov. 14, has been postponed. The dates for the holding of the future show have not yet been determined.

* * *

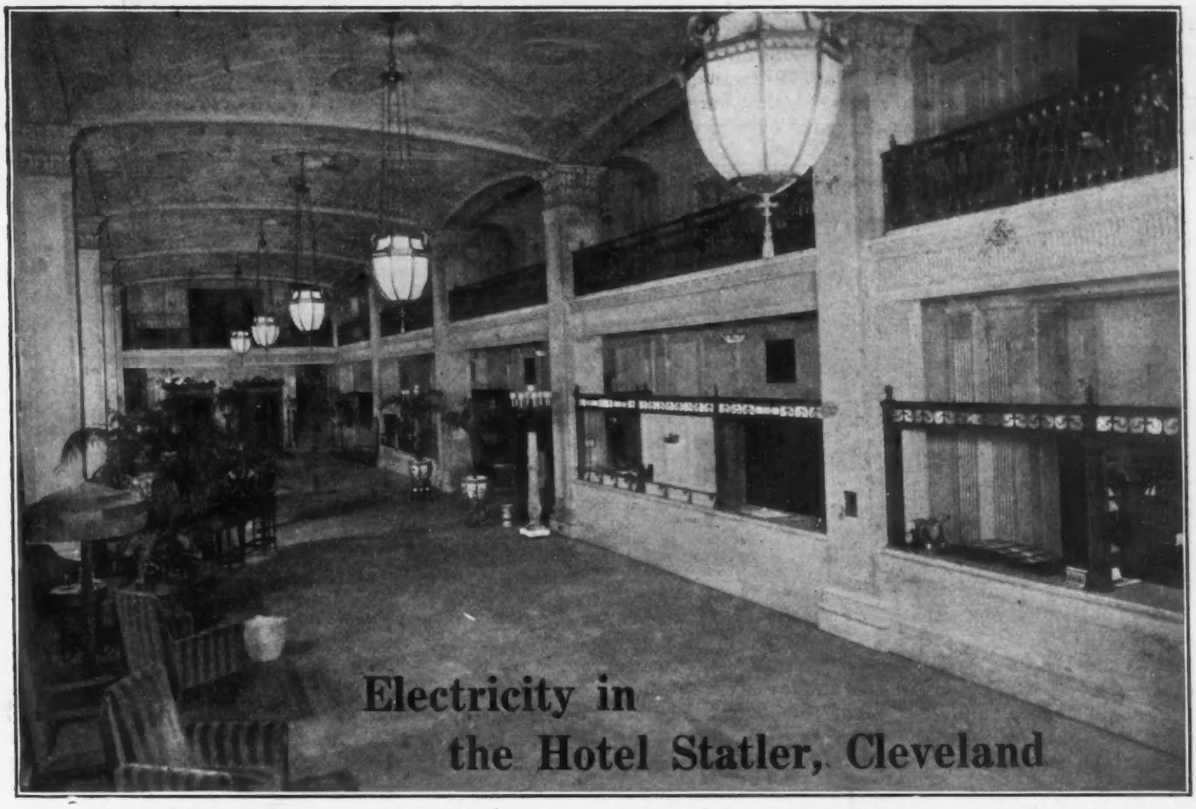
JOVIAN ANNUAL MEETING.—Mr. Martin J. Wolf, of St. Louis, chairman of the nation-wide promotion committee for the annual meeting of the Jovian Order to be held in St. Louis on Oct. 14, 15 and 16, is doing great work. He is telling the Jovians in each state how many men they ought to have at the convention and contrasting one state with another in friendly rivalry. He says: "Don't feel that the other fellow will do the work, will work up enthusiasm. You do some." An interesting and elaborate convention program is in preparation.

* * *

INSTITUTE OF RADIO ENGINEERS.—The first meeting of the Institute of Radio Engineers for this season was held Sept. 2 at Columbia University, New York, when Mr. David Sarnoff, of the Marconi Wireless Telegraph Company, presented a paper on "Radio Traffic." The passage of a wireless-telegraph message from sender to destination over interlinked line and radio telegraphs was traced and the difficulties in traffic handling imposed by the present radio laws were discussed. A brief description of the traffic methods to be used in operating the Belmar-New Brunswick transatlantic stations followed. Messrs. V. Ford Greaves, George S. Davis, Robert H. Marriott, Emil J. Simon and John L. Hogan, Jr., discussed the paper at some length, taking up more particularly the need of radio legislation designed to meet modern conditions of radio engineering. The next meeting will be held on Oct. 7.

* * *

MEETING OF EMPIRE STATE GAS AND ELECTRIC ASSOCIATION.—The annual meeting of the Empire State Gas and Electric Association will be held on Oct. 2, beginning at 10 a. m., at the Engineering Societies Building, New York. Mr. J. W. Lieb, vice-president New York Edison Company, and Mr. R. M. Searle, vice-president Rochester Railway & Light Company, will open the general discussion at the morning session on the subject of the supply and renewal of incandescent lamps. The main topic in the afternoon will be gas rates. The Empire Gas & Electric Company, of Auburn, N. Y., has differential gas rates in effect, and Mr. E. H. Palmer, president of that company, will speak on this subject. Mr. E. E. McCall, chairman of the New York Public Service Commission, First District, and Mr. Seymour Van Santvoord, chairman of the Second District Commission, will probably speak at a luncheon which will be served in the Engineers' Club.



Electricity in the Hotel Statler, Cleveland

IT is a significant commentary on the success of central-station service to other great hostelries of the country that when the electricity-supply problem of Cleveland's handsome new Hotel Statler came before the owners and architects for decision the business was awarded to the Cleveland Electric Illuminating Company. And now, after nearly two years' experience with the convenience and reliability of central-station service, it is gratifying to learn that the management of the hotel feels well satisfied with its selection of purchased service as against the annoyance, dirt and expense of operating its own plant.

Probably no other type of customer, all things considered, offers the central station such a large revenue per customer or per kilowatt of connected load as does the hotel, unless it be certain classes of industrial plants. From the standpoint of publicity for the central-station, too, the hotel load must be regarded as valuable, particularly as an example of the varied character, the economies and the conveniences of modern electric service.

With a connected load of nearly 800 hp in motors and about 7500 tungsten lamps of sizes ranging from 5 watts to 250 watts, the Hotel Statler at Cleveland represents an electrical load which would be attractive to any electric-service company. Typical load charts show that the average maximum demand for the entire equipment is about 380 kw, the peak coming on at about 8 p. m. The smallest load of the twenty-four-hour day generally occurs during the early morning hours, when the use of the general lighting equipment is at a minimum and the demand on the various pumps is light. An average of the monthly readings of the totalizing watt-hour meter shows that the hotel uses approximately 150,000 kw-hr. a month.

To secure pleasing illumination of the lobbies, dining-rooms, ballrooms, corridors and other public places, elaborate chandeliers and concealed lighting effects have been employed. An especially handsome effect has been obtained in the Pompeiian dining-room by concealing 200 tungsten lamps in reflectors behind a frosted-glass cathedral dome. In order to obtain long life in these

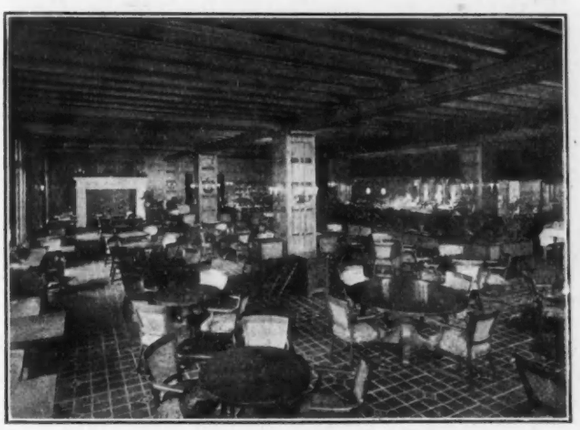


FIG. 1—LIGHTING OF THE GRILL ROOM

FIG. 2—USE OF CANDELABRA FIXTURES IN PARLOR

60-watt tungsten lamps, which are rather difficult of access for making renewals, 130-volt units are used on 115-volt circuits. Above the dome a 0.25-in. rough-wire-glass skylight has been so arranged that during the hot summer months chilled water runs over it in a continuous sheet, cooling the dining-room to a temperature several degrees below that of the outside air. In addition to the general illumination of this room, portable lamps harmonizing with the decorative scheme of the room are placed on the tables near the wall and on the mezzanine floor.

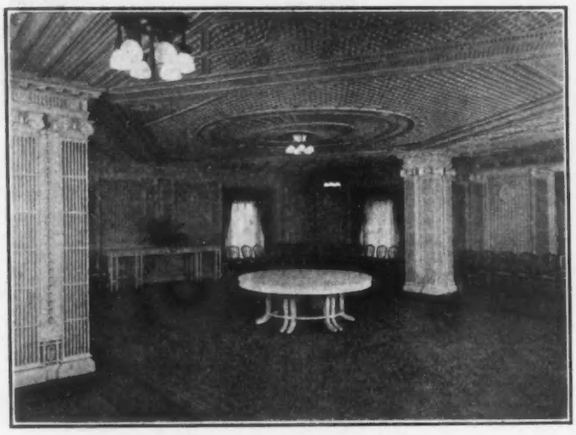


FIG. 3—SPECIALLY DESIGNED LIGHTING FIXTURE

In the main lobby massive but graceful fixtures hung at 20-ft. centers diffuse the light from 200 40-watt lamps, supplying a soft and even general illumination which in the alcoves is supplemented by smaller diffusing bowl units of similar design. Additional light for the clerks' desks and the hotel register is afforded by small lamps in the molded-metal trough shown at the right of the title-piece illustration. These lamps also give prominence to the signs telling patrons to which clerk to apply for "Information," "Rooms," and the room, the remainder coming from lamps concealed behind the skylight. Eight-watt round tungsten lamps are used in the wall candelabra fixtures.

In the guest rooms and in the corridors all lamps are inclosed in diffusing bowls. The largest lamps in the building are the 250-watt units used to light the barber shop, and the smallest lamps are the 5-watt units outlining the electric sign on the roof.

FIG. 5—LIGHTING OF THE GREAT BALLROOM

Situated as it is in the down-town direct-current district, the hotel is furnished with electrical energy from the 115-230-volt Edison system of the Cleveland Electric Illuminating Company. The Edison-service switchboard and the house-service board, although both composed of marble panels, are constructed as separate units, the latter being surrounded by an ornamental molding.

The number of electric motors in the building is about 110. To supply ice and artificial refrigeration, three motor-driven Frick refrigerating machines have been installed. Two of these units, 60-ton machines, are used to make ice and are operated alternately for two-week periods. The third and smaller machine is used exclusively for ice-cream manufacture. Behind the large unit shown in Fig. 8 may be seen the driving motor connected to the large gear by means of a silent chain. To the right and in the rear of the same illus-

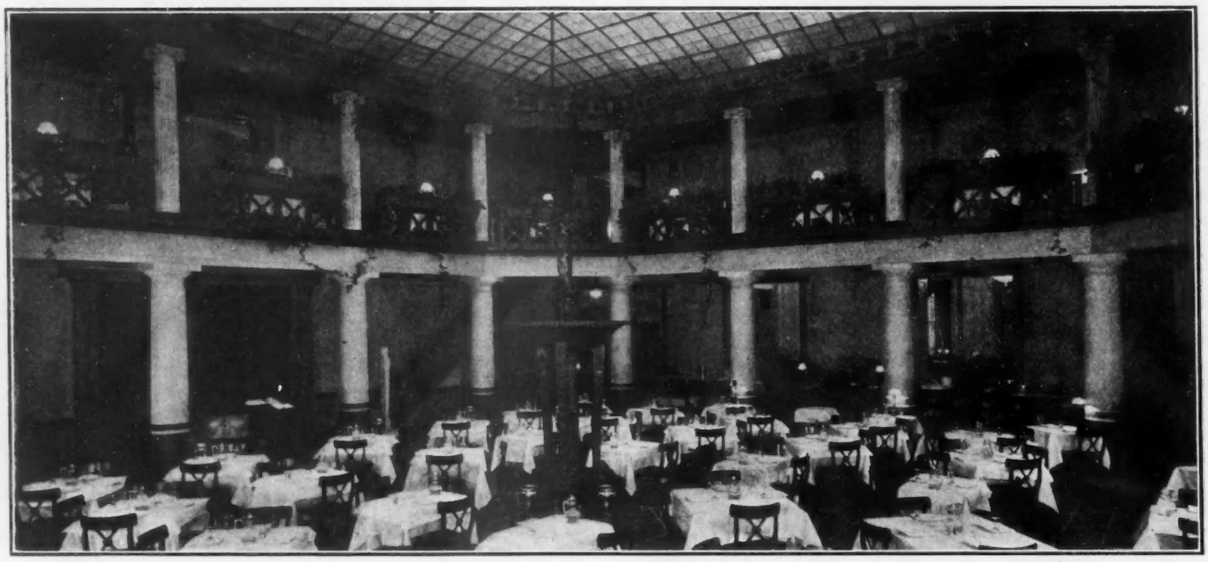


FIG. 4—INTERIOR OF POMPEIIAN DINING-ROOM

like. The lobby is 30 ft. in height, 31 ft. wide and 200 ft. long.

Still another type of hanging fixture has been used in the ballroom. However, the few 25-watt lamps in these fixtures supply but a part of the lighting for the

tration are two 5-hp motor-driven, brine-circulating pumps serving as auxiliaries to the refrigerating system. Behind these is the large tank used for cooling drinking water circulated to the guests' rooms.

The control apparatus for the three refrigerating

FIG. 6—SWITCHBOARD, SHOWING EDISON SERVICE ENTRANCE

machines is grouped on a square marble column. Leads enter and leave this unique panelboard from the top, so that all live connections, rheostats and starters are concealed. The two small panels at the right of the picture control the operation of vacuum pumps working on the steam-heating system and producing a "vacuum" of 12 in. to 14 in. of mercury column. Steam enters the heating system from the central-station mains at approximately 1 lb. pressure.

Two 30-hp, 220-volt motors, directly connected to top-discharge pumps, lift water from the city mains to three tanks on the roof of the thirteen-story building.

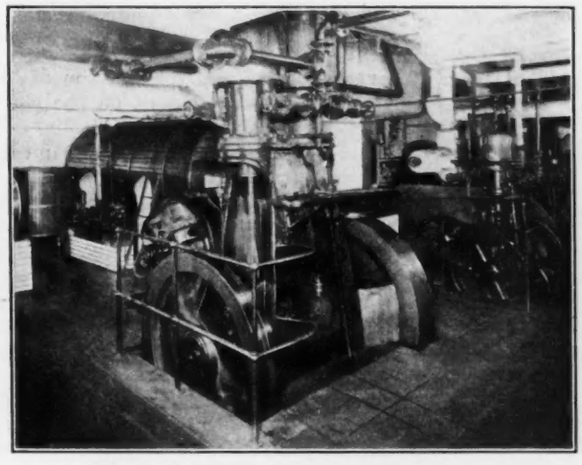


FIG. 8—REFRIGERATING COMPRESSORS

Water for house service is then fed by gravity to the various parts of the hotel. Automatic starters attached to floats in the tanks control the operation of the pumps and hence the water level in the tanks. Other installations of motor-driven pumps are used in connection with washing, ozonizing and cooling the air supplied for ventilating purposes.

Washing and drying of clothes, together with ironing, is performed electrically in the laundry operated in the hotel. The accompanying table shows the ma-

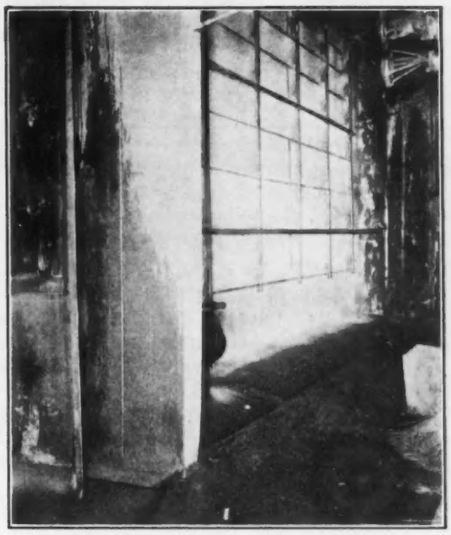


FIG. 7—WATER CURTAIN FOR COOLING AIR

chines used and gives the sizes of the driving motors.

MOTOR-DRIVEN MACHINES IN LAUNDRY

	Motor hp.
Two 6-in. steam-roll collar ironers	3
16-in. steam-roll collar ironer	
No. 24 show collar shaper	Fractional
Bishop seam dampener	Fractional
Point dampener	Fractional
Shirt-bosom press	2
Two electrically heated reverse body irons (3 hp each)	6
40-in. by 60-in. dry tumbler	3
Eight washing machines (3 hp each)	24
Five extractors (5 hp each)	25
120-in. six-roll Hagen irons (66 ft. per minute)	5
48-in. steam Annihilator iron (mangles)	

The Hotel Statler in Cleveland has now been in operation about twenty-four months, giving Mr. John

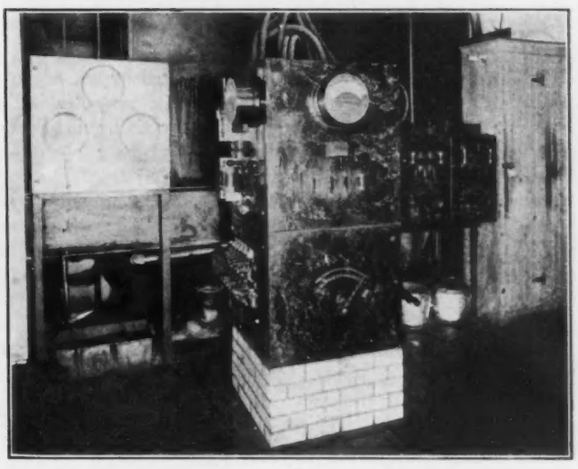


FIG. 9—CONTROL PANELS FOR REFRIGERATING MACHINE

H. Graham, chief engineer, and his assistant, Mr. Emmet J. Graham, an opportunity to confirm the claims made for the economy of central-station service and to realize its convenience, reliability and efficiency in an establishment of this kind.

Pole and Tower Transmission Lines

Width of right-of-way and its relation to line construction details—Constituents of factor of safety for wires—Conditions governing length of span. By R. D. Coombs

THE simplest manner of providing a right-of-way for a transmission line is to obtain a franchise from the municipality to set poles along streets or lease or purchase the right to erect poles or towers on private property. Although this method is by far the more common, it seems probable that in the future there will be a marked increase in the number of rights-of-way for both pole and tower lines purchased outright. Private rights-of-way, while naturally more expensive in point of original cost, permit the most economical construction, are unaffected by restrictive regulation, and eliminate the necessity of making excessive expenditures for increased transmission facilities. The abnormal expense involved in hurried construction and the excessive payments often required to complete a right-of-way (sometimes amounting to a species of blackmail) are perhaps not always fully realized. Such expenses would be greatly reduced if a private right-of-way were held, particularly when subsequent lines are to be constructed thereon. It may be argued that excessive prices will be demanded for continuous rights-of-way, as usually happens when railroad companies attempt to acquire land for their purposes. While the unit prices usually asked are unquestionably excessive for land which may be serving no purpose at all, yet they may not be excessive for a right-of-way, as has been proved in the case of the railroad rights-of-way. Heretofore private transmission-line rights-of-way have been purchased chiefly where land was very cheap and when an important line on wide-base towers had to be constructed. It is probable, however, that equally effective reasons may be advanced for purchasing private right-of-way in more settled communities, where it is necessary to build a series of pole lines.

Width of Right-of-Way

There seems to be no general standard or set of rules by which the width of a right-of-way may be determined. The two factors which appear to have had the greatest influence on the width of existing rights-of-way are the probable ultimate number of pole or tower lines to be erected thereon and the height of adjoining timber. There are several other conditions which should affect the width, among which are the total desired security of the lines, the character of the country traversed, and the character of the construction.

Where the nature of the ground permits, some consideration may be given to patrol and transportation facilities between the lines of supports. Apart from any question of cultivation or possible railway facilities, the remaining controlling conditions are all involved in the general one of protection from interruptions. Interruptions may originate either within or without the limits of the right-of-way. Those from within are generally caused by mechanical or electrical failure and are best minimized by separating the lines. Those from without may be caused by fires, malicious mischief, falling trees, limbs, straw or other objects blown by the wind, etc. Interruptions from these causes can be minimized by allowing sufficient marginal clearance. As interruptions are generally caused by disturbances outside the right-of-way, more consideration should be given to marginal clearance than to internal clearance. Some engineers declare that the distance from the base of the towers to the nearest boundary of the right-of-way should equal or exceed the height of the tallest neighboring trees. If this rule were applied literally, the width of the right-of-way would have quite variable limits and in some localities would assume excessive values. While some degree of consideration may properly be given to the average height of timber, it must not be forgotten that the effective range of wind-blown branches is greater than can always be allowed for economically. It is advisable to cut down or trim the taller trees and to remove dead branches, since

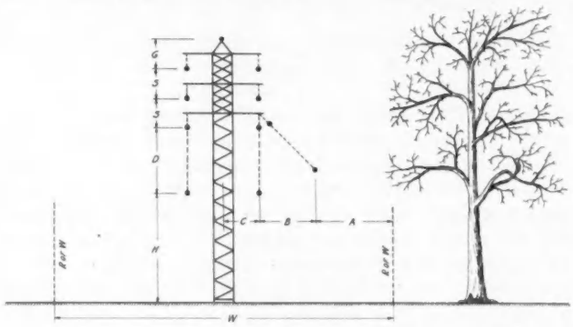


FIG. 1—DOUBLE-CIRCUIT, SINGLE-TOWER-LINE RIGHT-OF-WAY

storms would presumably blow these onto the line before the smaller and live timber was affected.

Relation Between Tower Design and Clearance

The width of a right-of-way and the location of the towers thereon depend to a great extent on the character of the construction, as the clearance must be sufficient to prevent wind-blown conductors coming in contact with each other or with the towers and the trees. Long-span construction will therefore require greater clearances than short-span construction. Steel poles or narrow-base towers permit the closest spacing of lines, both on account of their narrow spread at the ground and because they are usually employed with shorter spans and smaller sags. If the supports are staggered—that is, if the poles in one line stand opposite the mid-span points of the adjoining lines—less clearance is required to prevent swinging contacts. The general security desired also affects the width of the right-of-way and the location of the poles or towers. One line in the middle of a wide right-of-way has the maximum possible security. In wild, treeless country two lines near the edges of the property are more nearly immune against service interruptions than in positions with a smaller separation. One tall and one short line are more secure than two tall lines, because the short one can rarely affect the other. All things considered, the lines should be constructed so as to permit the great-

est freedom of future construction, a reasonable separation between lines, and a maximum clearance from the side lines.

In order to facilitate the study of right-of-way clearances, three types of installations are shown. One represents a two-circuit steel pole or narrow-base tower, erected in the middle of a private-right-of-way; another

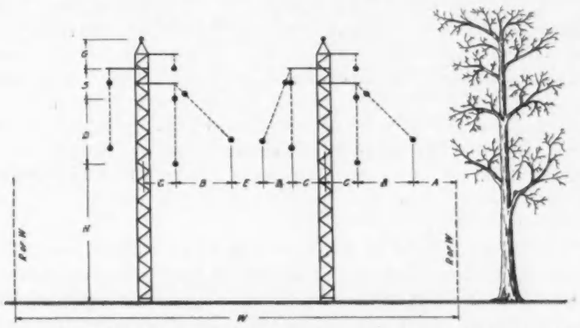


FIG. 2—CLEARANCES FOR TWO SINGLE-CIRCUIT TOWER LINES

shows two one-circuit poles, while the third shows two one-circuit wide-base towers.

In each case it is assumed that suspension insulators are used. To modify the diagram for pin-type insulators it is necessary only to adopt slightly smaller values for the conductor deflection and the clearance between the tower and the wires in their normal positions. The windward-deflected sag B in the two-tower rights-of-way is shown as one-half that of the leeward-deflected sag B_1. The assumption is, of course, arbitrary and would vary for different sizes of wires, spans and sags. The table gives the probable ranges of the various clearances, the summation of which determines the width of the right-of-way. The probable range of the width w is also shown for three (assumed) minimum marginal clearances of 6 ft., 15 ft. and 25 ft. The presence of tall trees overhanging the right-of-way line is undesirable, but it cannot always be avoided. The accompanying diagrams indicate the limiting clearances which should be allowed.

Factor of Safety

As in all construction work, the mechanical factor of safety should receive by far the most important consideration. Indeed, the factor of safety will not only affect the selection of the details of construction but will practically determine the general type of line to be used. In actual practice, however, this fact seems to be lost sight of, for the factors of safety are almost always the last values to be definitely determined, whereas they should be the first and governing features. In other words, the method in general use at present is a cut-and-try method, in which several designs based on different factors are first worked out and the final selection too often left to one individual's judgment or to the suggestion of the salesman.

It is extremely doubtful whether competitive designs received by most purchasers have been really comparable in so far as their true mechanical factors of safety were concerned. In addition to the vagaries of competitive bidding it may be claimed, with considerable justice, that comparative designs as ordinarily made by the purchaser are not truly comparative.

For an accurate survey of the conditions influencing the selection of the proper factors of safety for the various members involved, it is essential that consideration be given to the desired length of service of the line, as well as to the characteristics of the parts and materials involved in their construction. Included in the term "length of service" are many items difficult of accurate determination; hence considerable engineering judgment must be employed in selecting the design of tower or pole to be used. Changes in the load on the line itself, a possible future increase in voltage, or the entire elimination of the line from an operating standpoint, may be assumed with some degree of accuracy, but the probable life of the materials of construction and the possibility of restrictive public regulation are extremely difficult to determine, either for a given line or for future developments as a whole.

The factor of safety, or, as it is sometimes termed, the "factor of ignorance," is a much-abused and generally misunderstood expression. In reality it is a combination of the allowances for error. The amount of the total factor depends, or should depend, upon the

APPROXIMATE RANGE OF RIGHT-OF-WAY CLEARANCES EXPRESSED IN FEET

	One Double-Circuit Tower Line	Two Single-Circuit Tower Lines	Two Double-Circuit Tower Lines
Span	300 to 500	300 to 500	500 to 800
B	20	20	20
B	3 to 12	3 to 12	10 to 25
B_1	.....	1 to 6	6 to 12
C	3 to 6	3 to 5	4 to 8
C	.....	3 to 5	3 to 6
If A = 6 ft., W =	25-50	35- 80	65-135
If A = 15 ft., W =	40-65	55- 95	85-155
If A = 25 ft., W =	60-85	75-120	105-175

accuracy with which the condition of service and the characteristics of the members and material can be foretold. If the possible variation of all individual elements except one is known, then the allowances for the known elements entirely eliminate any necessity for further considering "safety." An increase in the total factor results in a disproportionate increase in the one unknown.

Constituents of Factor of Safety

For example, the factor of safety in wires may be subdivided as follows: (a) increased loading; (b) uncertain strength of the material; (c) injuries during erection; (d) errors in erection (improper sag), and (e) deterioration in the material. While the factors of safety allowed for each of these constituents should vary for each installation, their relative values might be expressed as follows: a, 30 per cent; b, 20 per cent; c,

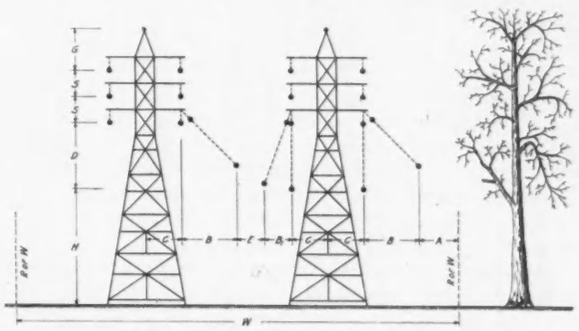


FIG. 3—SPACING OF TWO DOUBLE-CIRCUIT TOWER LINES

10 per cent; d, 30 per cent, and e, 10 per cent, making the total 100 per cent. Adding to this the breaking strength, which is assumed as 100 per cent, a total factor of safety of 200 per cent is obtained. In other words, the commonly used factor two permits the loading and breaking strength to be underestimated 30 per cent and 20 per cent respectively, the strength to be decreased 10

per cent by small injuries, the stress to be increased 30 per cent by improper stringing, and the conductor to deteriorate 10 per cent before the span is theoretically at the point of failure.

Omitting for the moment any consideration of the elastic limit and the fact that stresses in excess thereof will necessitate pulling up slack (with or without undesirable results), it is evident that any further increase in the factor of safey must result in greatly increasing the most uncertain element. On the other hand, if the strength of the wires assumed in the design corresponds closely with the material as purchased, and the wires are strung with care and with sags approximating those in the design, it is apparent that the spans will safely withstand a very considerable increase in the assumed loading. It is highly probable that in many instances inaccurate wire stringing has increased the stress more than 30 per cent above that allowed for, thereby entirely changing the actual strength of the wires in relation to external loads.

The above analysis is, in the writer's opinion, a fairly accurate statement of average actual conditions, and does not give the correct values for the elements of the factor of safety of wire spans designed and constructed under competent supervision.

Length of Spans

Since the cost of the material between supports—i.e., the wire—is practically constant, except for the slight increase in length due to the sag, the supports should be spaced far apart. With long spans the number of insulators is reduced, together with the probability of interruption originating at the supports. Other considerations usually prevent the adoption of the theoretically economic span length, however. The conductors must be spaced so as to provide sufficient clearance between adjoining wires and between the wires and the pole. Therefore with an increase in span length, with its consequent increase in sag, it becomes necessary to spread the wires further apart, thus lengthening the cross-arms and increasing their cost. With comparatively few wires in the line, it is possible to arrange them so that long spans can be used without excessively long or heavy cross-arms, but on heavy lines carrying many wires this is not practicable without unduly increasing the height of the poles.

Long spans are not always practicable when lines are situated on highways, as the length of cross-arms may have to be restricted, or the wooden poles available may be unable to withstand loads due to long span lengths. The matter is further complicated by the mechanical limitations of standard, or stock, cross-arms, pins and insulators. On steep hills the spans must be decreased or the supports lengthened to maintain the overhead clearance.

The size of conductors has more of a determining effect upon the proper or possible length of span than any other condition. The large sags required for small wires necessitate excessive wire spacings and pole heights for long-span construction.

No exact economic span length has been determined either for one type of support or for one section of country. In fact, it is extremely probable that for any particular line there will be two designs of nearly the same estimated cost, and that the possible error in estimating the field work will far exceed any difference between the estimates.

Serious error may be made in estimating the probable replacement cost of high, long-span, wooden-pole installations. In view of the present prices and scarcity of long poles, it may be possible that such lines cannot be rebuilt with timber at any reasonable cost. The wooden-pole transmission line is an entirely proper type of construction in many cases, and it is also true that for one or two circuits the spans could often be lengthened to advantage, but such lines should be protected against decay and a high replacement expense assumed in estimating the cost of the line.

While the economic construction for traversing hilly country is undoubtedly to cross ravines and small valleys by means of long spans, it is possible that this practice may be injudicious unless ample clearance is provided between the wires. There is little exact knowledge of the dependence to be placed upon the parallelism of swinging wires, particularly if their horizontal spacing is 5 ft. to 10 ft. and the sag 15 ft. to 30 ft. Besides the accidental contact of wires in the same horizontal plane, there have been instances of the lower wires being lifted by the wind into contact with those above.

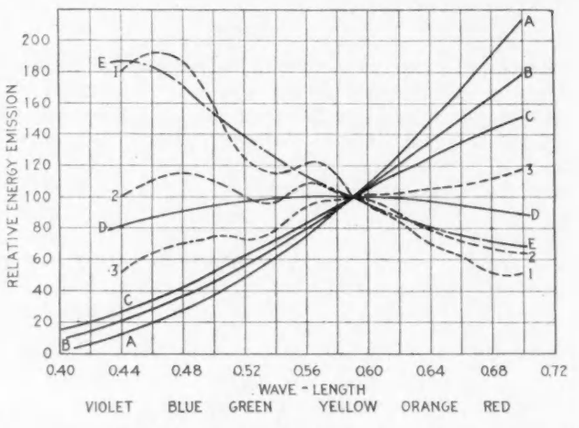
In cases where it will be necessary to pay rent for pole rights on foreign property it may prove economical to use long-span construction, as the rent saved might more than pay interest on the increased cost of the supports. In ordinary country the economic span is probably between 400 ft. and 500 ft. for narrow-base supports and between 600 ft. and 800 ft. for wide-base towers.

REALIZATION OF ARTIFICIAL DAYLIGHT

Practical Methods Developed for Reproducing North Skylight and Noon Sunlight

By M. Luckiesh

The development of artificial light is the result of man's desire to become independent of daylight. To a considerable degree this desire has been realized, but complete independence can be enjoyed only after daylight has been produced artificially. If the tungsten filament could be operated at about 5000 deg. C. absolute, the resultant quality of light would be near that of noon sunlight. Unfortunately this cannot be done, so that the most practical method of producing artificial daylight at present is found in the use of a colored screen which alters the tungsten light to a daylight quality. The possibility of producing artificial daylight by this method has long been known. One of the chief obstacles has been the inefficiency of the artificial light sources available for the purpose. A light source radi-



A, tungsten lamp (vacuum) operating at 7.9 lumens per watt. *B*, tungsten lamp (gas-filled) operating at 15.3 lumens per watt. *C*, tungsten lamp (gas-filled) operating at 22.0 lumens per watt. *D*, clear noon sunlight. *E*, north blue skylight. 1, 2, 3, three kinds of artificial daylight produced with glass screens.

FIG. 1—SPECTRAL DISTRIBUTION OF ENERGY

ating all the rays found in daylight—that is, one having a continuous spectrum—is quite desirable as a producer of artificial daylight. Other desirable characteristics are steadiness, unvarying quality and high efficiency. The tungsten lamp has been looked upon with favor for this purpose and several attempts have been made to produce artificial daylight therefrom, some of which have been successful while others have not been sufficiently exact to warrant their adoption. However, the colored screens used for altering the artificial light to a daylight quality have usually included a perishable dye. None of the successful units has warranted adoption for general lighting owing to a low efficiency, and hence they have been chiefly of scientific rather than of practical interest.

Among the early experiments in the production of artificial daylight by means of the tungsten lamp and a colored screen were those carried out by Ives and Luckiesh* in the Nela Research Laboratory with the old (vacuum) tungsten lamp. As in other units devised for the purpose, a perishable organic dye was found necessary for obtaining the final correction. There was little incentive to develop the scheme further, owing largely to the inefficiency of the old tungsten lamp as a producer of artificial daylight. With the advent of the new high-efficiency tungsten lamp greater possibilities were recognized. The writer therefore began the development of glassware which would meet many requirements where light of a daylight quality is desired.

In the first place, it is necessary to obtain standards of daylight. These were chosen from available data, also bearing in mind the particular demands for daylight indoors. It was decided that three kinds of daylight, and therefore three classes of glassware, were desirable. The first when used with the high-efficiency tungsten lamp should reproduce north skylight; that is, the light from an average north sky. This would find its use in arts requiring accurate discrimination of colors.

The second class was designed to reproduce clear noon sunlight. This could be taken as an average daylight because it represents approximately the mean of all phases of daylight out of doors during ordinary daylight working hours. This unit would find a field in the general lighting of industrial plants, such as those engaged in lithographing, color printing, manufacture of paints and wall-papers; also in paper mills, paint shops, cigar factories, art galleries, etc.

A third class was considered as a compromise between daylight and ordinary artificial light. From another viewpoint this class might be considered as a compromise between wattage and quality of light. With these three classes in mind the problem of obtaining colored glass was attacked.

FIG. 2—VIEW IN LITHOGRAPHING PLANT, SHOWING PROPERLY TINTED GLASSWARE

Considerable spectrophotometric data obtained by various observers on sunlight and skylight are available. Ives collected these data and combined them with his measurements made in the Nela laboratory. The means of these results are shown in Fig. 1. The distribution of energy in the spectra of three tungsten lamps, as determined by Mr. F. E. Cady, is shown in comparison with the data on skylight and sunlight. The method of obtaining artificial daylight from the tungsten lamp involves the problem of obtaining a

*Electrical World, May 4, 1911.

colored glass of such character that the transmitted light contains the various colored rays in the same proportions as they are found in the particular daylight to be imitated. A number of coloring elements are found to be necessary in order to produce a glass which fulfils the requirements.

In order to learn the efficiencies which can be obtained in producing artificial noon sunlight or skylight, computations were made. A light source which radiates all visible rays can be said to have a certain daylight efficiency. For instance, the light from a tungsten lamp can be considered as being composed of light of a clear noon sunlight quality plus a certain amount of yellow light. The ratio of the amount of light of a clear noon sunlight quality to the total amount of light can be taken as the sunlight efficiency of the light source. A similar consideration applies to skylight efficiency. The old tungsten lamp operating at an output of 7.9 lumens per watt is found to have a noon sunlight efficiency of 14 per cent and a north skylight efficiency of 4 per cent. The gas-filled tungsten lamp operating at 22 lumens per watt (0.5 watt per horizontal candle) is a much more efficient producer of daylight, its noon sunlight efficiency being 25 per cent and its north skylight efficiency 13 per cent. These values are for very accurate production of the daylights considered. In many cases in actual practice the imitation of daylight need not be so accurate as that considered in the foregoing computations. This would mean higher daylight efficiencies. However, it is seen from the foregoing figures that with the new high-efficiency tungsten lamp accurate noon sunlight can be produced at 5.5 lumens per watt and accurate skylight at 3 lumens per watt. Thus artificial noon sunlight can now be produced at an efficiency not far from that of the old tungsten lamp, and artificial skylight can be produced at an efficiency near to that of the old carbon-filament lamp. No more striking illustration of the progress in the efficiency of tungsten lamps can be given.

A glass may be of a proper color to alter the tungsten light to a daylight quality and yet have a transmission coefficient much lower than that of the theoretically ideal screen. In mixing colors into the glass the tendency is always toward black, so that a glass might correspond to the ideal glass combined with a smoke glass. There is therefore the problem of transparency besides the purely spectral problem. After considerable experimenting a glass has been obtained which is quite satisfactory as viewed both from the spectrophotometric data and from actual trials in competition with natural daylight. It is found to approach the ideal screen quite closely both in efficiency and transmission characteristics when used with the high-efficiency tungsten lamp operating at 0.5 watt per horizontal candle. It can be used with gas-filled lamps of lower efficiency, but there is a decrease in the quality of light. It can hardly be hoped to produce an efficient colored glass which is theoretically ideal, so that the effect of variations from the ideal can be ascertained only by practical tests. Owing to the variability of daylight due to atmospheric conditions and reflection from surroundings such as trees, buildings, walls, etc., some variation in artificial daylight is permissible.

In Fig. 1 are also shown the spectral analyses of the light from a tungsten lamp (22 lumens per watt) after passing through glasses of correct tint. The glass (1) which produces artificial skylight when used with the gas-filled tungsten lamp operating at a high efficiency produces artificial noon sunlight when used with the vacuum tungsten lamp. By decreasing the thickness and slightly altering the composition of the foregoing glass, artificial noon sunlight is produced by means of the high-efficiency tungsten lamp at an efficiency not far from that of the older type of tungsten lamps. Thus the second class of glassware (2) mentioned earlier in the paper is realized. By further reducing the thickness of the glass and combining it with opal glass by casing or intimately mixing the two the third class of units (3) is realized. These units are satisfactory for store lighting, producing a quality of light between noon sunlight and the original tungsten light; that is, a better quality of light than is obtained at present from any unaltered source available for general lighting.

It is thus seen that daylight can be made artificially at an efficiency sufficiently high for general lighting purposes. Up to the present time the great preponderance of illuminating engineering procedure has been chiefly along the lines of distribution of light. This side of lighting problems has reached a fairly well-developed state. Proper distribution by means of scientifically designed and properly located reflectors conserves light and produces good results. Attention to scientific distribution of light began in the days when artificial light was produced at relatively low efficiencies. With the greater efficiencies of light production of the present day the other great factor found in lighting problems—quality or color-value of light—can be considered. In other words, we can now afford to sacrifice light to obtain results long desired but heretofore impracticable. The importance of quality of light in lighting problems is very great from both esthetic and utilitarian considerations. When considering the uses for artificial daylight one needs only to indulge in a little retrospection in order to realize the importance of light of a daylight quality. The color values of artificial light sources are quite accidental, while daylight is a part of the scheme of creation. Artificial light sources are of recent origin while daylight has been with us always. Our color vision has evolved in daylight and many arts have been standardized under daylight illumination. Daylight, of course, varies very much both indoors and out of doors, yet notwithstanding this great variation during working hours, daylight in general is of a quality far different from that of the light derived from ordinary artificial sources. Daylight can now be produced efficiently with the new high-efficiency tungsten lamp, and the desire for it can be satisfied. Thus the possibilities in artificial lighting are continually widening.

Fig. 2 shows an installation of glassware of proper tint in a lithographing plant. Each unit consists of a 1000-watt tungsten lamp in a 12-in. ball which is supported by a white-enamel steel reflector. The installation is highly satisfactory owing to the steadiness and daylight quality of the light. These are necessary conditions for satisfactory color work under artificial lighting.

Salaries of Technical Graduates

In collecting data in regard to a class of mechanical, electrical and chemical engineers four years after graduation from a large Eastern college, plain envelopes were distributed, in which the men returned anonymous slips stating the number of firms or corporations they had worked for since graduation and their present monthly salaries. The average number of employers was 2.5, and the average salary was $161.63 per month. The salaries of the sixty-three men were divided as follows: Thirteen men had salaries up to and including $100 per month, thirteen to $125, ten to $150, eight to $200, four to $300 and five above $300. Ten men did not report.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

Electric Vehicles and the Central Station

At the Narragansett Pier convention of the New England Section of the N. E. L. A., Sept. 2 to 4, the committee upon the recognition of electric-vehicle interests in New England, of which Mr. W. H. Atkins, Boston Edison Company, is chairman, submitted a report on the state of the electric vehicle, based upon replies to questions sent to seventy-five representative central stations, sixty-seven of which responded to the request for information. Of these companies, thirty-one make use of an aggregate of 78 passenger and 179 commercial "electrics" in their own business, while thirty-six make no use of electric vehicles. In the territory covered it is estimated that over 757 passenger and 341 commercial electrics are in use aside from those in central-station work, or a total of 814 passenger and 520 commercial cars. (The total number of electric vehicles in use in New England at present is not far from 1500.)

Nineteen companies have a department or representative to follow this class of business; twenty-eight claim to co-operate with electric-vehicle agents in promoting sales; thirty-three companies maintain garages or provide charging stations, and twenty of the companies are members of the Electric Vehicle Association of America. Thirty-six companies expressed themselves as willing to provide or promote a charging station in their cities, while five expressed themselves as unwilling. Seventeen of those not already using electric vehicles signified their willingness to endeavor to employ at least one in their business. The data received indicate that the possibilities of the electric vehicle as an off-peak revenue producer are not yet appreciated by many central stations in New England, and the committee emphasizes the desirability of adopting a more progressive attitude. Of the 236 electrics in use by the sixty-seven companies, ten of the companies use 66 per cent of the total, five companies use 57 per cent, four 53 per cent, and one 34 per cent. The work thus far done has been accomplished by a comparatively small number. The committee recommends the purchase by each central station of any size of at least one electric vehicle, membership in the national organization, the equipment of each plant with charging facilities, and reductions by manufacturers in the first cost of electric vehicles. At its last meeting the committee discussed the advisability of forming a company made up of central-station representatives for the manufacture of low-priced electric vehicles, but decided that the matter should be tabled for the present. Closing, the report points out that if 300 New England central stations should each buy one vehicle and cause one to be sold to a customer, assuming a daily consumption of 15 kw-hr. per machine, there would be a total commercial income of $225 per day added to the existing revenue of these companies.

Discussion

Mr. Frank J. Stone, Electric Storage Battery Company, Boston, Mass., presented data upon the income possibilities of electric vehicles. A 700-lb. delivery wagon will consume 3526 kw-hr. in a year of 312 days' work, giving the central station an income of $105 at a 3-cents-per-kw-hr. rate. This size of machine has a connected load of 4.4 hp and thus turns into the central station a revenue of $24 per hp of connected load, without requiring any particular increase in generating equipment. A 5-ton truck consumes 11,100 kw-hr. per year, pays the central station $333, has a connected load of 7.2 hp, and yields an income of $46.30 per hp of connected load. The average annual revenue of the central station for all sizes of electric vehicles, including the foregoing, is $208.81. Other figures presented by the speaker illustrated the reliability of electric-vehicle service. Tower wagons of the Philadelphia Electric Company made 17.1 miles per day for 328 days, trimming from 170 to 200 lamps daily per wagon. One of these wagons made a maximum of 190 stops per day. The winter record of a 1000-lb. delivery wagon in New York department-store service was an average of 24.5 miles and fifty-four stops per day, with a maximum of 42 miles and 102 stops per day.

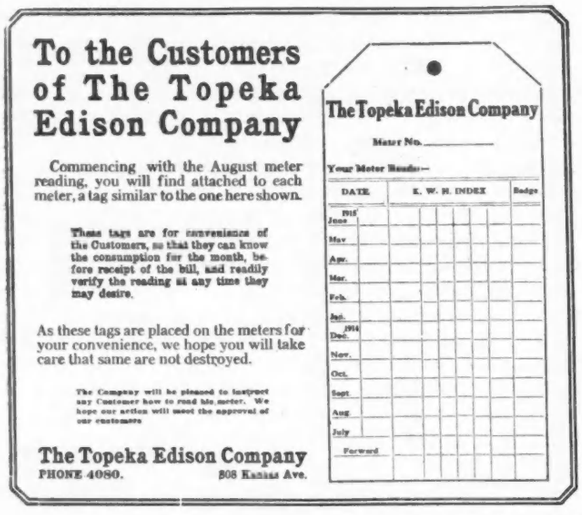
Mr. R. B. Daggett, Commercial Truck Company of America, Boston, stated that if the price of a two-thousand-dollar chassis was cut in half only 6.6 per cent of the annual cost of operation would be saved. Cutting the charging rate from 5 cents to 3 cents per kw-hr. is equivalent to cutting the price of the chassis in two, and it is as important that a reduction of 4 cents per kw-hr. be made from a maximum of say 6 cents as it would be to supply the chassis free. Mr. W. H. Bolewine, Springfield, Mass., described the electric-vehicle applications of the United Electric Light Company, pointing out that delays by manufacturers in furnishing supply parts hampered development of this class of service. He did not feel that the national advertising of the Electric Vehicle Association of America had made much impression locally. Mr. Walter Kirk, Lynn, Mass., favored private charging stations compared with installations in gasoline garages.

In a trenchant discussion Mr. L. D. Gibbs, Boston, told his hearers that the electric vehicle cannot be stopped by the central station, no matter what the attitude of the latter may be, and urged every central station to take a hand in the movement and derive profit from it without waiting to trail along behind. The day is close at hand when the companies will be forced by the public to give the electric vehicle its proper service and when the companies themselves will have to use this class of equipment or become hopelessly out of date. Mr. F. Nelson Carle, General Vehicle Company, urged central stations to adopt these machines in their own service and "cash in upon the confidence of their customers." Albums of photographs of installations are among the most convincing aids to the sale of trucks. Mr. W. H. Blood, of Stone & Webster, Boston, past-president of the Electric Vehicle Association of America, appealed to all the central-station men present to take advantage of their opportunities and at least make a beginning by purchasing a truck for company service. With the Stone & Webster properties the use of "electrics" is now general. Mr. Day Baker, General Vehicle Company, Boston, paid a tribute to the co-operation of the central stations and described a number of the

representative installations in New England. More charging stations are needed. In mill-yard service the electric truck shows a saving over horse traction even on runs only 200 yards long. Other speakers were Messrs. H. H. Skinner, Providence, R. I.; W. M. Thayer, Hartford, Conn.; D. W. Beaman, New Bedford, Mass., and George W. Holden, Edison Storage Battery Company, Boston. Mr. Thayer said that the battery-exchange system has now been developed at Hartford so that fifty-seven trucks have been sold. The trucks supplied by the company on this system have run 810,611 miles since the service was inaugurated in 1910, the mileage in August, 1914, being 42,359.

Encouraging Consumers to Verify Meter Readings

The Topeka (Kan.) Edison Company marks customers' service-meter readings on tags permanently attached to the meters so that the consumer may verify his readings at any time or check the amounts of energy


To the Customers of The Topeka Edison Company
Commencing with the August meter reading, you will find attached to each meter, a tag similar to the one here shown.
These tags are for convenience of the Customers, so that they can know the consumption for the month, before receipt of the bill, and readily verify the reading at any time they may desire.
As these tags are placed on the meters for your convenience, we hope you will take care that same are not destroyed.
The Company will be pleased to instruct any Customer how to read his meter. We hope our action will meet the approval of our customers
The Topeka Edison Company
PHONE 4080. 808 Kansas Ave.
The Topeka Edison Company
Meter No.
Your Meter Reader
DATE
K. W. H. INDEX
Badge
1915
June
May
Apr.
Mar.
Feb.
Jan.
1914
Dec.
Nov.
Oct.
Sept.
Aug
July
Forward

CENTRAL-STATION ADVERTISEMENT SHOWING COMPANY'S TAG

for which he is billed. The consumers have been informed of the new plan through the local newspapers and have been advised through the same medium that instructions for reading meters will be sent to them on request.

Increasing Central-Station Business

At the Glenwood Springs convention of the Colorado Electric Light, Power and Railway Association, Sept. 3 to 5, several papers dealing with the general subject of central-station business promotion were read and discussed. Abstracts of these are given below. A news item relating to the convention and abstracts of other papers appeared in the issue of the *Electrical World* dated Sept. 12.

In a paper entitled "Selling Electricity for Industrial Purposes," which was read by Mr. Frank D. Burr, of the Denver Gas & Electric Company, emphasis was placed on the importance of courtesy and fair dealing in public service, and co-operation urged between all the departments of an electric-service company in order to assure continuity of service and avoid complaints and to obtain the largest consumption of energy possible. He emphasized the importance of filling up valleys in load curves and said that consumers should be induced to use electricity more extensively to make up for the reduced energy consumption of high-efficiency illuminants. For a similar reason it was recommended that a constant search be made for new energy-consuming devices.

Various applications of motors to industrial purposes were described and the use of refrigerating apparatus for cooling hotels and office buildings was mentioned. Among other subjects discussed were: Industrial applications of heating; irrigation pumping as a motor load; use of off-peak energy in dairies and creameries, and the sterilization of milk by high-voltage alternating current. Electrochemical industries furnish an attractive load because of their long-hour demand. Large quantities of electricity will also be required for testing low-grade ores by the new method. It was suggested that all industrial organizations, chambers of commerce and electrical interests combine to advertise and develop the local industries, which in turn will become desirable customers for central stations.

Refrigeration and Heating

In answer to a question by Mr. G. N. Robinson, of the Denver office of the General Electric Company, concerning small refrigerating machines which can be used satisfactorily for domestic purposes, Mr. Burr said that he knew of two machines which can be operated with a ¼-hp motor. He added that one of these sets will soon be demonstrated in the salesroom of the Denver Gas & Electric Company.

Mr. J. A. Clay stated that he had made experiments at Ouray, Col., in heating a business house with electricity, and said that such a load would be profitable if energy could be sold at 0.45 cent per kw-hr. He asked if other member companies were carrying heating loads of this class, and if so at what price. Mr. Burr replied that the only heating load which the Denver company carries consists of luminous radiators, which are used in the fall and spring to avoid starting furnaces. Regular lighting rates are charged for the energy supplied to these heaters.

In answer to Mr. Hammond, who asked if any member company had secured a contract for operating refrigerating apparatus in apartment houses, Mr. Burr replied that he had received encouragement from prospective builders of high-class apartment houses, who contemplated installing such apparatus and charging a higher rental for the added convenience.

Electric-Arc Welders

A paper on "Industrial Load Building," by Mr. J. Solberg, of the Westinghouse Machine Company, Denver, Col., was read by Mr. W. H. Bullock in the absence of the author. The opportunity for reducing operating costs in machine shops, boiler works, etc., by using electric welders was discussed therein. With an electric-arc boiler flues can be re-welded, worn threads on the armature shaft can be repaired, tap holes can be cut, and metal accumulated in the troughs of furnaces can be cut away. While the oxy-acetylene flame has the advantage of not drawing the temper in steel which is being welded, there is danger of the gas exploding if the apparatus is not properly handled. There is no danger, however, with the electric arc as the pressure across the electrodes is only 75 volts. Electric-arc welding is especially adapted to the welding of steel rails and boiler plates.

Mr. C. A. Somrad, manager of the Northern Colorado Power Company, Cheyenne, Wyo., stated that an electric arc welder is giving satisfactory results in the machinery department of the Union Pacific Railroad, where it is operated eight hours per day. It is used to repair burned-out fire-boxes, put on patches, etc.

GRIPPER & SIDE GUIDE

Illumination and Wiring

Grounding of Lighting Circuits

The final session of the Narragansett Pier convention of the New England Section of the National Electric Light Association, Sept. 2 to 4, was devoted to a discussion of the report of the committee on overhead-line construction as presented at Philadelphia this year. Mr. W. H. Blood, insurance expert of the association, addressed the meeting upon the grounding of secondaries up to 250 volts, as called for in the latest National Electrical Code. In this country 325 companies are now grounding secondaries. Water-works companies should be informed as to the entire safety of this practice and the impossibility of electrolysis from alternating-current circuits. The best practice is to ground to the water pipe at each individual consumer's installation. In a personal appeal to the membership, the speaker pictured the dangers of ungrounded service in their own homes and pointed out that unless companies adopt this practice they are liable to be found criminally negligent in case of accident.

Mr. C. A. Dean, Cambridge, Mass., said that his company will not supply service unless the installation is properly grounded. There is probably no place on the company's system where a ground is more than 500 ft. from the consumer's premises. Mr. A. D. Colvin, Hartford, Conn., said that in that city no ground made with an adjustable clamp is acceptable. Unusually thorough grounding is practised at Providence, R. I., according to Mr. W. H. Oviatt, both inside and outside grounds being established with a white-covered wire for the pipe connection.

Mr. Alexander Macomber, Boston, stated that the practice of grounding secondaries is to be standardized in all the Tenney companies. He questioned if the cost of grounding at each consumer's service is justified, favoring grounding at the transformer, using a brass plug in the water pipe. Mr. W. H. Bolewine, Springfield, Mass., stated that the city authorities propose to charge the company $1 per year per attachment to the water system, so that the policy will not be determined until more favorable terms can be obtained. The United Electric Light Company believed thoroughly in grounding. Mr. A. F. Townsend, Woonsocket, R. I., said that in cases where a group of houses owned by a single party is supplied with water through one meter the service pipe is grounded outside the meter, a jumper is placed around the meter, and each house pipe is utilized as an interior ground in addition. Mr. Ralph Sweetland, New England Insurance Exchange, Boston, paid a tribute to the work of Mr. Blood in securing the establishment of the grounding rule. He said that fourteen years' experience showed that in 99 per cent of the cases grounding will prevent all trouble when primary and secondary circuits get together. The speaker condemned grounding at the transformer and advocated service-pipe grounding on account of the inspection facilities. Others who spoke briefly were Messrs. M. G. Haight, Worcester, Mass.; W. B. Kirk, Lynn, Mass.; W. S. Wyman, Augusta, Maine; A. E. Burland, Boston; D. W. Beaman, New Bedford, Mass., and H. T. Sands, Malden, Mass. The session closed with a brief discussion of the importance of periodical examinations of oil in transformers and switches and comments of several central-station men present upon the proper separation of high-tension and low-tension circuits when carried on the same pole line. A minimum separation of 6 ft. between cross-arms was advised, with the grounding of cross-arms and pins at railroad and other crossings. Mr. Percy Wilson, Lowell, Mass., cited the excellent results of oil filtering through two tins of unslacked lime and sand in the order given, and Mr. C. A. Mixer, Rumford Falls, Maine, said that the break-down test of oil increased from 4000 volts to 70,000 volts after filtering. The use of better grades of insulators than those normal to a line was advocated at crossings. Mr. Macomber said that transformer oil should be filtered at least once in two years and switch oil yearly, depending on the service conditions. Mr. W. H. Cole, Boston Edison Company, said that the use of wire nets in crossing protection has been abandoned.

Ornamental Magnetite-Arc Lighting at Dallas, Tex.

The business section of Dallas, Tex., is lighted by 425 4-amp magnetite-arc lamps suspended from ornamental cast-iron posts placed at intervals of 70 ft. along the curb on both sides of the street, the lamps on opposite sides being staggered with respect to each other. The installation was made by the adjoining property owners, who paid an assessment per front foot covering the cost of the underground construction, the lamp-posts and the electrical energy for the first year's

FIG. 1—MAGNETITE-ARC ILLUMINATION OF COMMERCE STREET, DALLAS, TEX.

GRIPPER & SIDE GUIDE

operation. The electric company furnished the plant equipment, lamps and overhead construction necessary to supply the service. The rate for this lighting is $45 per lamp per year, the units being extinguished at midnight. An unusual feature of the rectifier equipment is a cooling tower which is employed to reduce the temperature of the water circulated through the cases containing the transformers and rectifying tubes. Energy for the Dallas ornamental street lighting is furnished by the Dallas Electric Light & Power Company, of which Mr. Edward T. Moore is general manager.

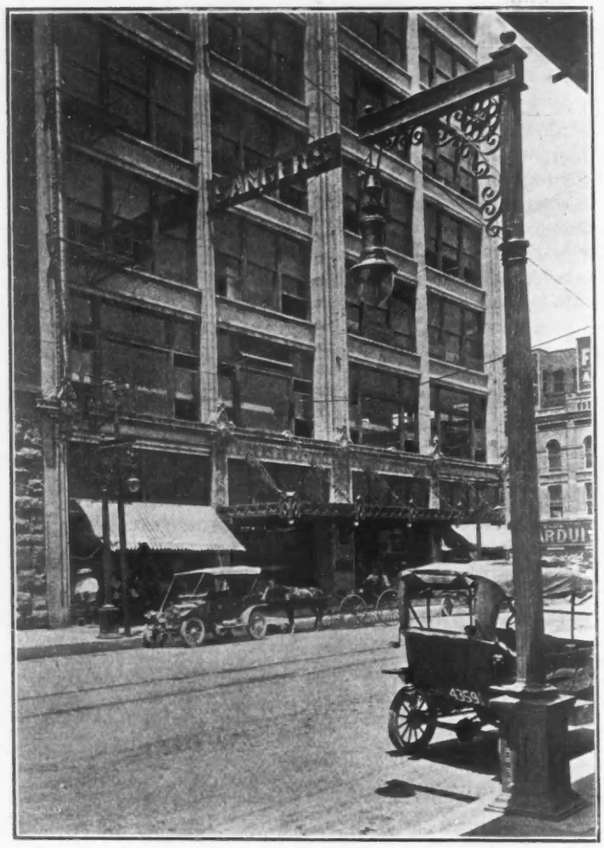


FIG. 2—TYPE OF ARC-LIGHTING POST USED AT DALLAS, TEX.

A Striking One-Letter Electric Sign

"Longue Vue," a famous restaurant overlooking the stately Hudson River near Hastings-on-Hudson, N. Y., has a novel electric sign which never fails to attract the attention of passengers on passing night boats. The restaurant building is on a high eminence and at a little distance back from the water, so that to have erected an electric sign making the whole name visible from the river would have required a sign structure almost as large again as the restaurant building itself. The difficulty was solved, however, by installing a single very large universal box letter, arranged with a flasher to spell out successively "L-O-N-G-U-E V-U-E." After a few seconds' intermission, the letter-box again spells through the name. As the sign is mounted on the very peak of the roof of the building, 200 ft. above the river, its regular flashes, like the loom of some distant lighthouse, are visible for miles up and down the stream and serve to arouse the curiosity of travelers long before the letters themselves are near enough to be read.

Letters to the Editors

Municipal Ownership Facts

To the Editors of the Electrical World:

SIRS:—Municipal ownership has again assumed national importance by the reporting to Congress of the bill for government purchase and operation of the street railways in Washington. The pending congressional election affords an opportunity to public utility representatives throughout the country to state their case fully and frankly to the men who will constitute the next Congress. It is a duty which the public utilities owe to themselves as well as to their associates to take advantage of this opportunity. When they are seeking votes candidates for Congress usually are glad to listen to their constituents. The public utilities in each congressional district from Maine to California and from Texas to Minnesota should arrange to present to the candidates of both parties, in definite and concise form, the facts about municipal ownership in general, the Washington situation and the bearing of the latter on local conditions. If the facts regarding municipal ownership were known by the representatives of the public, the numbers of its adherents would wane. Now is a good time to get a hearing from the members of the next Congress. Public utilities should seize and make the most of the opportunity.

WILLIAM D. KERR,
Director Bureau of Public Service Economics.

New York.

Moving Pictures That Create the Wrong Impression

To the Editors of the Electrical World:

SIRS:—Under the title "An Innocent Delilah," there was recently shown in Chicago a motion-picture film depicting incidents of a damage suit instituted by Western ranch owners against an electric-service corporation for usurping water rights. The hero of the picture play was the bright young rancher representing the interests of the land owners, the villains were the president of the water-power company and his staff of lawyers, and the heroine "Delilah" was the daughter of the principal villain, the president. In the course of the play the president of the power company is seen using nothing but unlawful and devious methods of securing certain deeds and titles to waterfalls, and in his nefarious scheming he is aided by his daughter, who is at the time innocent of what she is doing. Eventually she learns of the true situation, returns the deeds to their rightful owner, the hero, and with him occupies several feet of film at the end of the picture, giving the public that thrill it always enjoys at seeing the play end with the hero and heroine in fond embrace.

Entertaining as this film may be, it abounds in incidents sure to leave the spectators with wrong impressions concerning the character of executives of hydro-electric enterprises. Such a company is a benefit to adjacent communities rather than a grabbing, grafting octopus. At a time such as this, when water-power legislation is pending, popular sentiment ought not to receive such misleading impressions, and if the *Electrical World*, the Society for Electrical Development, or any other interest or body desiring that all parties get fair play, can influence motion-picture syndicates to adhere more strictly to truthful situations in their plays, the effort will be well worth while in the interest of the public as well as in that of the water-power companies.

Chicago, Ill. J. R. DUNHAM.

GRIPPER & SIDE GUIDE

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Connections That Insure Flexible Feeder-Circuit Regulation

Switching apparatus employed in the Commerce Street station of the Milwaukee (Wis.) Electric Railway & Light Company permits of very flexible voltage regulation of feeder circuits. Each feeder has its individual voltage regulator, and a spare unit is installed to furnish regulation when any of the other sets become inoperative. Each regulator is equipped with the same design of switch, the entire set being connected by a common spare bus. The construction of the switches and their connections to the regulators and spare and energizing buses for different conditions of operation are clearly shown in the accompanying diagram.

The lower jaws of each switch are led to its regulator, the upper left-hand jaw to the spare bus, the upper right-hand jaw to the left-hand hinge and feeder circuit, and the right-hand hinge to the energizing bus through an oil switch. The left-hand hinges and jaws

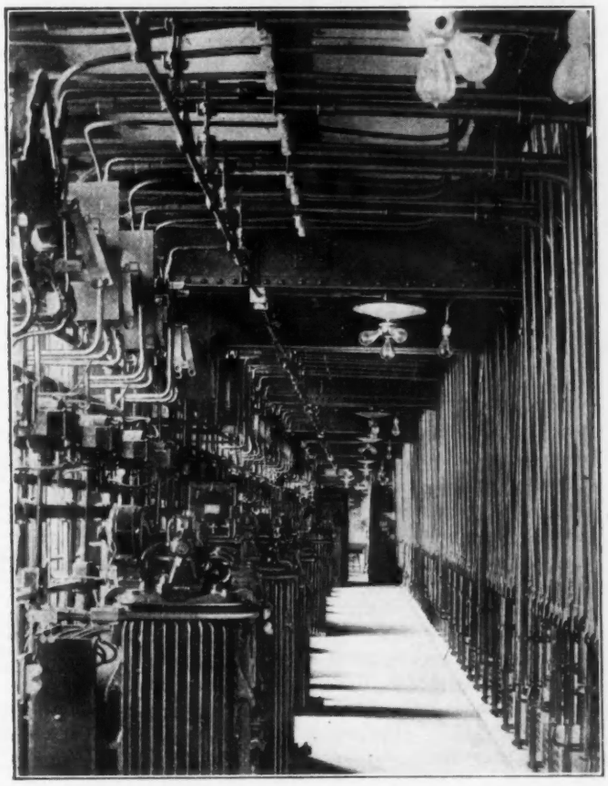


FIG. 1—FEEDER REGULATORS AND SPARE BUS SWITCH IN COMMERCE STREET STATION, MILWAUKEE

are designed to accommodate twin blades separately operable. All of the blades are provided with slots in which hooks can be inserted to move the blades.

With all three blades of a switch in the lower position the particular feeder circuit is regulated by its respective regulator. With the right-hand blade in the upper position and the twin blades open, the circuit is unregulated. By connecting the upper and lower left-hand jaws of the spare regulator switch with the twin blades and placing the right-hand blade in the lower position any feeder circuit can be regulated by connecting it to the spare bus.

To control several feeder circuits from the spare regulator, the left-hand blades of each feeder switch are

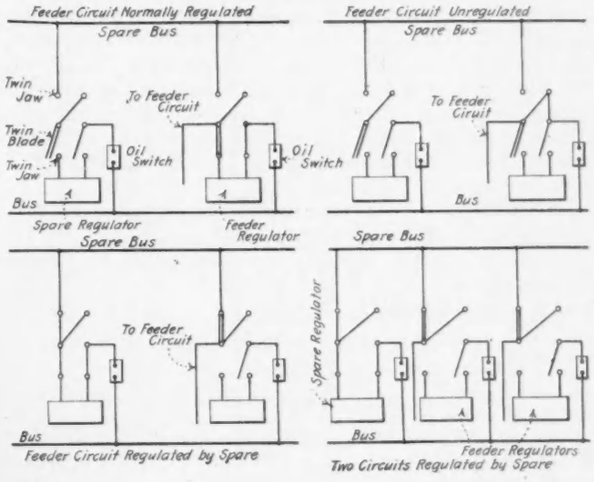


FIG. 2—DIAGRAM SHOWING SWITCH CONNECTIONS FOR DIFFERENT OPERATIONS

placed in the upper position, connecting them to the spare bus, and the spare bus switch is connected as previously described. The scheme described was devised by Mr. G. G. Post, the company's electrical engineer, and proves useful also for isolating the feeder regulators and oil switches when it is necessary to inspect them without de-energizing their respective feeder circuits. Because of the uniformity of the connections of these switches it is possible to reverse the operations described and to make any regulator take the place of the spare one.

Danville Company Decides Against Deep Condenser Pits

Improvements under way in the station of the Danville (Ill.) Street Railway & Light Company will make that power house when completed one of the most up-to-date plants owned by the Illinois Traction System. Two 4000-kva, 2300-volt, sixty-cycle, three-phase General Electric turbo-generators will be installed in an addition to the present building. These machines are among the first 4000-kva units ever manufactured to operate at 3600 r.p.m. The old reciprocating-engine sets, which have been acting as reducing valves on the heating system, will be retained in their present positions and operated during the steam-heating season. The condensing turbines will carry the load during the summer months. To supply draft for the additional boilers

GRIPPER & SIDE GUIDE

which will need to be operated with the increased station rating, an 18-ft. by 250-ft. brick-lined steel stack is being erected on a 32-ft. steel structure, having its base in the present boiler.

One of the chief engineering problems in the design of the plant was that of condenser arrangement. Two surface condensers with approximately 8000 sq. ft. of surface will be purchased and installed beneath the turbines, the bottom of the hot-well being about 24 ft. beneath the engine-room floor. At first the advisability of digging a 60-ft. pit beneath the engine-room floor for these condensers was considered. This plan would have reduced the necessary lift of condensing water from the river to about 18 ft. However, after some consideration it was decided that the saving from reduced pumping cost would not capitalize a sufficient amount to build the pits and tunnels. It was also thought that the work of caring for condensers in such an inaccessible position would be unduly difficult and would probably be less satisfactory, as workmen do not like to stay in hot subterranean pits any longer than necessary. It was also thought that with the condensers at this low level sufficient circulating water might not be available in periods of drought. The company intends building a concrete dam, and with the condensers at their present level the circulating water can be returned to the upstream side of this structure, cooled, and used again.

With the present arrangement the engine-room floor stands about 78 ft. above the river, and by placing the condensers at their present level the circulating pump will act against a head of about 47 ft. Mr. J. E. Johnson is local manager at Danville.

A Pneumatic Water-Level Indicator

In its hydroelectric plants on the Chattahoochee River the Columbus (Ga.) Power Company employs a novel pneumatic method for indicating at the switchboard the water level in the forebay outside. If an excess of compressed air be admitted to a tube the free end of which is immersed below the water line, the air pressure within the tube can rise only until it just equals the head of water over the pipe opening, after which any further air pumped into the tube will escape in the form of bubbles. The air pressure everywhere in such a tube will then be at all times exactly equal to the height of the water over the pipe opening. A pressure gage attached to the upper end of the pipe may therefore be calibrated to read directly in feet of water level.

As actually constructed by the Columbus company, the apparatus is extremely simple, consisting of a recording gage connected with a hollow-wire tube one end of which is immersed to a point below low-water level. Air is admitted to the tube through a reducing valve, for it is important that the pipe be kept filled with air lest the accuracy of the device be destroyed. To maintain the surface of separation between the air and water at the mouth of the submerged tube, air is fed into the hollow wire just fast enough to allow bubbles to escape slowly from the opening. Constant agitation of the water at the mouth of the tube also prevents the accumulation of sediment which might clog up the tube.

Air is supplied to the tube from a high-pressure tank through a reducing valve, needle valve and sight-feed receptacle. Pressure gages are connected in the air-supply line on each side of the reducing valve to indicate the storage-tank and feeder-pipe pressure. The rate at which air is fed into the hollow wire is regulated by the needle valve and indicated by the sight feed. The latter consists of a glass receptacle partly filled with water through which the air is allowed to bubble freely.

As the hollow wire presents resistance to the flow of air, the air-supply tank should be placed as near the outlet of the tube as possible. The tube leading to the gages, however, transmits only static pressure, hence it may be of any moderate length, as friction need not

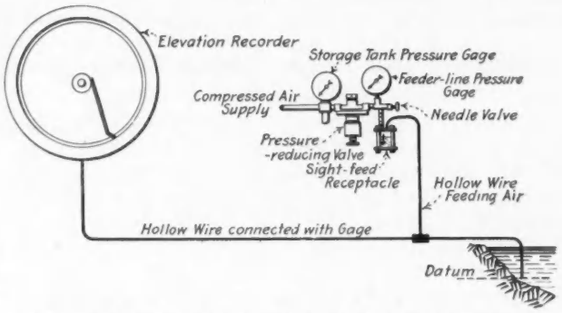


DIAGRAM OF APPARATUS FOR RECORDING WATER ELEVATION

be allowed for. The tube may be buried in the ground or supported by a messenger wire strung on poles with electrical conductors.

Changes that may occur in temperature do not affect the accuracy of the records as heat only causes the air in the tube to expand and escape in bubbles at the mouth until the hydrostatic and air pressures are equalized.

Effect of Furnace Design and Method of Firing on Efficiency and Smoke Production

How should the furnace of a return-tubular boiler be designed to give the best efficiency and prevent the production of smoke when low-grade slack coal is being burned? What method of firing is recommended for this type of boiler? M. A. P.

Experiments have been conducted recently by the Bureau of Mines to determine the effect of furnace construction, methods of firing and auxiliary air supply on the efficiency and smoke production of return-tubular boilers, using the fuel mentioned in your question. Among the conclusions drawn from the results of these tests are the following: Prevention of smoke can be accomplished more easily by employing the coking method of firing than by using the alternate spreading method; by supplying supplementary air to a furnace immediately after firing the production of smoke can be reduced and the over-all efficiency increased; a brick arch placed directly over a grate and underneath the boiler shell lowers the over-all efficiency and tends to produce more smoke; screening the heating surface in the combustion chamber from direct radiation from the brickwork lowers the combined efficiency. Furthermore, a gas-deflecting arch placed back of the bridge wall produces better combustion by mixing the gases more thoroughly. The same effect may be obtained by dividing the space back of the bridge wall into two parallel passages having wings to deflect the gases. The following conclusions hold for the conditions under which the tests were conducted but may not be true under different conditions: Devices for admitting air to the combustion chamber through apertures above the furnace doors and in the bridge wall appear to be equally effective in reducing smoke and increasing the efficiency. Steam jets installed above the furnace doors and directed at the rear end of the grates failed to show a sufficient gain in efficiency or reduction in smoke to make their use desirable.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Limitations of High-Tension Direct-Current Machines.—ARTUR SCHERBIUS.—The construction of high-tension direct-current machines is in principle possible for very high voltages, but practical limits are set by the cost and weight of such machines. The author discusses the relation between weight, cost, speed and voltage of high-tension direct-current machines and emphasizes that all means which facilitate and improve commutation permit an increase in the voltage limit. This is especially true for machines of very small output and for machines of which the cost is of small importance, so that, for instance, high-tension machines for 0.2 amp or 0.1 amp with sufficiently large dimensions can be built for voltages many times those of standard machines for larger outputs. The author refers to the 3600-volt direct-current six-pole machine design of Thury and gives the following table which shows how other designs for 3600 volts, but with a different number of poles, can be deduced from it if the armature length, the pole pitch on the commutator, the circumferential speed of the commutator and the current per brush arm remains the same:

Poles	Kw	Amp	Revolutions per Minute
2	90	25	900
4	180	50	450
6	270	75	300
12	540	150	150
20	900	250	90

It will be seen that the maximum speed becomes 900 revolutions per minute, and for this speed the output is reduced to 90 kw. The current and the output of such machines can be increased in proportion to the length of the armature and the armature diameter. For the machine in question the total armature length is 32 cm and the circumferential speed of the armature is 19.4 m per second. Both figures could be increased. At the same time the commutator would have to be lengthened. This would be easy mechanically, since its useful length is only 7.5 cm, but on the other hand any increase of the current would have a bad effect on the commutation. Nevertheless, it would be possible to increase somewhat the figures in the second and third columns. From theoretical formulas developed by the author and from the data of the Thury machine, the author concludes that with a rotary converter a voltage of 3600 can be obtained only for frequencies not higher than fifteen and three-tenths cycles per second; with a frequency of fifty cycles per second the maximum voltage is 1100. The generation of high-tension direct current by means of converters at frequencies of fifty cycles or so is therefore possible only within narrow limits.—*Elek. Kraftbetriebe u. Bahnen,* July 24, 1914.

Rotary Converters.—G. MATTAUSCH.—The first part of an article on rotary converters. The author gives formulas for the ratio of the electromotive forces for single-phase, three-phase, four-phase and six-phase converters, and shows how the ratio of the emfs depends on the wave-form of the alternating current, on the load and on the excitation. He then takes up the armature current and the heating of the armature of the converter. The article is to be continued.—*Elek. Rundschau,* July 29, 1914.

Lamps and Lighting

Tube Lamps with Noble Gases.—A note on a paper read by Dr. Lederer at the recent annual meeting of the Association of Austrian and Hungarian Central Stations at Cracow. The lecture dealt with "recent improvements in electric lighting," and at the end of the lecture the author reported on experiments with "a new form of tube lamps." The tubes are similar to the Moore tube lamps and are filled with noble gases, such as argon, neon, helium, xenon and krypton. The feature which distinguishes these tube lamps from the Moore tube lamp is that they are filled with monatomic gases and are operated at the normal voltage of the city supply networks, such as 220 volts. The alleged advantage of the use of monatomic gases over gases the molecules of which have several atoms is as follows: In order to be brought to luminescence the molecules containing several atoms must first be decomposed into their single atoms, since only then will they be able to conduct the electric current and give out light simultaneously. In order to produce light with a gas the molecule of which has several atoms a much greater energy supply is, therefore, necessary than with monatomic gases. Hence, from the viewpoint of illuminating engineering, tubes filled with monatomic gases must be far more economical than the Moore tube filled with gases the molecules of which contain several atoms or with gas mixtures. The experiments with the noble-gas tube lamp were made in the laboratory of the Westinghouse metallic-filament lamp factory in Vienna and gave good results.—*Elek. Zeit.,* Aug. 13, 1914.

Train Lighting.—An illustrated description of a pressure-reducing motor-generator for delivering high-pressure direct current for use in the Amsler train-lighting system.—London *Electrical Review,* Aug. 21, 1914.

Generation, Transmission and Distribution

French Distribution System.—J. REYVAL.—An illustrated description of the electric distribution system of the Bassin de Briey, which is one of the liveliest industrial districts of eastern France and in which mining and metallurgical industries are developing with rapid speed. A portion of this district is supplied with electric energy from the network of the Energie Eclairage, which supplies now 1725 kw against 950 kw a year ago.—*La Lumière Elec.,* July 25, 1914.

Speed Control of Three-Phase Induction Motors.—J. SCHMIDT.—An illustrated article on three-phase induction motors with six different speeds obtained by changing the number of poles, and on their use in textile printing plants. The article is to be continued.—*Elek. Anz.,* July 30, 1914.

Traction

Direct-Reading Instrument for the Measurement of the Resistance of Rail Joints.—J. REYVAL.—At the recent exhibition of instruments of the French Physical Society an apparatus was shown which had been developed by J. Carpentier in connection with the electrical laboratory of the French State Railways, and which permits the direct measurement of the resistance of rail joints in terms of the length of jointless rails having the same resistance as the joint. Two

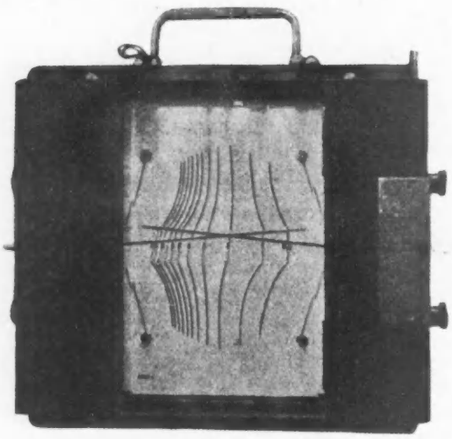


FIG. 1—APPARATUS FOR MEASURING RESISTANCE OF RAIL JOINTS

millivoltmeters are combined in one apparatus, as shown in Fig. 1, so that the needles of the two instruments cross each other. One of the millivoltmeters is shunted in parallel with a length of one meter of jointless rail; the other millivoltmeter is shunted in parallel with the same length of rail containing a joint. Evidently from the two deflections thus obtained it is possible to determine by simple formulas the resistance of the joint, but the particular advantage of this apparatus is that curves are plotted on the scale by means of which it is possible to read directly the resistance of the rail joint by observing the point at which the two needles cross each other. In the development of the apparatus particular attention has been paid to the construction of the millivoltmeter leads so as to get a very firm contact of the leads with the rail.—*La Lumière Elec.*, July 4, 1914.

Installations, Systems and Appliances

Storage Batteries Versus Isolated Plants.—BECKMANN AND J. HEISIG.—An article pointing out that in large buildings such as hotels, etc., it is often better to install a storage battery and buy energy from the city mains than to have an isolated plant. In Berlin fifty-four such batteries are connected to the electric system with a daily aggregate storage of 14,400 kw-hr. In Munich there are eighty such batteries capable of giving 4500 kw-hr. per day. The batteries are so dimensioned that at least the total energy required during the hours of peak load in the central stations can be supplied from the batteries. During the hours at which load in the central station is low and during which energy can be bought at a low rate from the central station energy is taken from the mains both for charging the batteries and for immediate uses for motor service or lighting. Details are given of the battery installation in the Kaiser Hotel in Berlin, which is equipped with 7000 incandescent lamps and fifty arc lamps, three passenger elevators, fourteen freight and food elevators, and with a total of seventy motors for driving various kinds of machines. Originally the energy was supplied from an isolated plant containing four suction-gas engines of an aggregate rating of 190 kw. This was replaced ten years ago by a storage battery, and energy is now being bought from the Berlin Electricity Works. The space requirements are one-third less than those of the isolated plant. The battery consists of 240 cells with a rating of 1596 amp-hr. at a discharge current of 399 amp. The maximum consumption during peak-load hours was 170 kw for four hours. When metallic-filament lamps were substituted for carbon lamps, the consumption decreased to 100 kw, and now energy is supplied to another large building in the neighborhood, which needs a maximum of 75 kw. The voltage of the network is at present 2×110 volts, so that 130 cells would have been sufficient. But, as it was intended to increase the voltage if necessary to 2×220 volts, the double number of cells was chosen from the very start, two cells always being connected in parallel. Two boosters of 14 kw each are also installed. The following comparison is given: The useful energy consumption during the year was 400,000 kw-hr., of which 133,000 kw-hr. was consumed between 10 p. m. and 7 a. m. at the rate of 4 cents per kw-hr., while for the remaining 267,000 kw-hr. a charge of 10 cents per kw-hr. was made, with a discount of 20 per cent. These are the rates of the Berlin Electricity Works. The total yearly cost of the energy bought from the Berlin Electricity Works without storage batter is, therefore, $26,680. On the other hand, when the storage battery was installed the first cost of the installation was $24,500, so that the yearly expense for interest and amortization at 12.5 per cent is $3,063. The expense for attendance, insurance and maintenance is $925; the rent is $900; the total cost of energy for 428,000 kw-hr. (including the battery losses), charged at a rate of 4 cents per kw-hr., is $17,120. Hence the total cost per year with the battery is $22,008, against $26,680 without the battery. This represents a yearly saving of $4,672, or 16.6 per cent of the original cost of the battery installation. Within six years the battery is therefore paid for out of the savings. In this comparison, however, the fact that part of the available energy is now being sold to another building in the neighborhood is not yet taken into consideration, since the total energy consumption during the year is not yet exactly known. If it is estimated from the present daily energy consumption, the final results of the above comparison would be changed as follows: The total yearly cost without battery is $43,250 and with battery $35,025, representing a saving of $8,225, or 33.5 per cent of the original cost of the battery, so that the latter is paid off in two or three years. For hotels or other buildings of this kind the availability of the battery is further of great importance as it insures continuous operation.—*Elek. Zeit.*, July 30, 1914.

Electrophysics and Magnetism

Selenium.—F. C. BROWN.—An account of an experimental investigation of the crystal forms of metallic selenium and some of their physical properties. In this research a large number of new crystals of metallic selenium were formed, some of very large size. All of these forms except one are very transparent selectively to light, a large amount of light penetrating to a greater depth than 0.2 mm. All the forms tested are conducting, showing a specific conductivity varying between 200 and 10^7. All the crystal forms but one have been observed to be doubly refracting. All the crystal forms increase in conductivity when illuminated. The action of light is in the selenium itself and not at the contacts. Mechanical pressure produces a genuine change in the selenium which may alter the conductiv-

ity more than a thousand times. The absolute change of conductivity in one crystal by constant illumination was proportional to the conductivity in the dark, when that conductivity was altered by pressures between 1 atmosphere and 180 atmospheres. The temperature at which the crystals sublimate in mass influences the character of the wave-length sensibility curves. The production of individual crystals of metallic selenium of large size opens up a large field of investigation, which promises to be free from some of the possible complexities in selenium cells.—*Phys. Rev.*, August, 1914.

Units, Measurements and Instruments

Determination of a Rotary Field with a Wattmeter.—A. KLEINSTÜCK.—In polyphase plants an exact knowledge of the direction of the rotary field, or of the sequence of the phases, is often necessary when meters or relays are to be connected. The easiest means are the use of a rotary-field indicator or the observation of the successive lighting up of star-connected incandescent lamps. If such means are not available, the wattmeter may be used as follows: The three-phase transformer is loaded with incandescent lamps and choking coils connected in star, as shown in Fig. 2. The current coil of the wattmeter is in one phase. The leads to the voltage coil are connected successively to the phases 1 and 2, then to 2 and 3, and finally to 3 and 1. In this way three deflections A_1 A_2 A_3 are obtained, and the ratio $A_1 : A_2 : A_3 =$ cos (30 deg. $+ \phi$) : sin ϕ : — cos (30 deg. — ϕ). If the deflections A would have the values of 0 deg., 30 deg., 60 deg., or 90 deg., the method would yield no results, but it is easy to adjust the deflections so as to get convenient values by connecting several incandescent lamps in each circuit in parallel. The determination of the power-factor cos ϕ is carried out in the well-known manner by measuring the real and the apparent power in one phase, an ammeter being connected in series with the wattmeter and the voltage coil of the wattmeter being connected between the phase in question and the zero point. The execution of the method is shown by the following example: Let the three phases be indicated by red, yellow and black colors respectively and assume that red is phase 1, yellow phase 2, and black phase 3. The ammeter and the current coil of the wattmeter are in the red phase. The measurement gives an emf of 111 volts and a current of 0.72 amp. The three deflections of the wattmeter are as follows: With the voltage coil between red and yellow, — 13.8 or + 13.8; with the voltage coil between

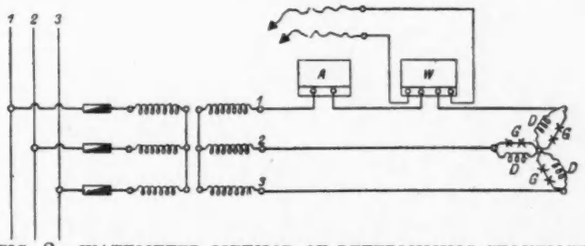


FIG. 2—WATTMETER METHOD OF DETERMINING SEQUENCE OF PHASES

yellow and black, + 74.4 or — 74.4; with the voltage coil between black and red, — 60.6 or + 60.6. The real power of one-phase is 29.4 watts, hence the power-factor, cos $\phi = 29.4 \times \sqrt{3} \div (111 \times 0.72) = 0.64$, or $\phi = 50$ deg. Hence the ratio of the three deflections of the wattmeter should be $A_1 : A_2 : A_3 =$ cos (30 deg. + 50 deg.) : sin 50 deg. : — cos (30 deg. — 50 deg.) = 0.174 : 0.77: (—0.94). If this ratio is compared with the wattmeter deflections really obtained, it will be seen that no agreement can be obtained in this way but that agreement is obtained if two phases are reversed. This means that the successive phases in the rotary field are not, as assumed, red, yellow, black, but red, black, yellow.—*Elek. Zeit.*, July 30, 1914.

Telegraphy, Telephony and Signals

Production of a Single Wave by Coupled Oscillation Circuits.—EMILE GIRARDEAU.—In comparison with direct excitation of the antenna, the indirect excitation by means of coupled circuits has the advantage that it permits the utilization of a considerable amount of power, but it has the disadvantage that two waves of different frequencies and different amortization are produced. In connection with the former work of others, the author shows first theoretically that it is possible to realize a system of coupled oscillation circuits by which only a single oscillation is produced. In the second part of the paper are described the results of experiments made in the Central Laboratory of Electricity in Paris, which show that this single-wave arrangement gives a better efficiency than the usual methods of coupling.—*La Lumière Elec.*, July 11 and 18, 1914.

Miscellaneous

Photographing Electric Sparks.—JOS. A. DETONI.—An illustrated article giving some hints upon how to photograph electric discharges or sparks.—*Elek. Kraftbet. u. Bahnen*, July 4, 1914.

Book Reviews

THE "MECHANICAL WORLD" POCKET DIARY AND YEAR BOOK FOR 1914. A Collection of Useful Engineering Notes, Rules, Tables and Data. Manchester, England: Emmott & Company. Baltimore, Md.: The Norman-Remington Company. 442 pages, 65 illus. Price, 25 cents.

This is a companion volume to the *Mechanical World* Electrical Pocket Book for 1914, and is the twenty-seventh issue of this book. The book, in the main, treats of British practice, but American standards and American practice are frequently introduced or referred to. By the use of a large number of pages and fine print it has been possible to include a great deal of material, a large part of which should prove useful to the designer and builder of machines. About one-half of the text is devoted to prime movers, including a section on the oil engine.

THE "MECHANICAL WORLD" ELECTRICAL POCKET BOOK FOR 1914. A Collection of Electrical Engineering Notes, Rules, Tables and Data. Manchester, England: Emmott & Company. Baltimore, Md.: The Norman-Remington Company. 310 pages, 129 illus. Price, 25 cents.

This little book is issued yearly and is a volume similar to the *Mechanical World* Pocket Diary and Year Book. It contains a great deal of the useful electrical information, based on British standards, which is ordinarily published in handbooks or pocket books. Some of the sections, notably "Notes on Accumulators" and "Transformers," are quite complete, considering the space allotted to them, while other sections, for example, "Telephones," present only an introduction to the subject. The book could be improved by exercising more care in the arrangement of the material, there being apparently no regular order of the topics treated. Different items referring to the same general topic are often widely separated in the text.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Outlet-Box Connectors

The outlet-box connectors shown herewith are being placed on the market by the Gillette-Vibber Company, New London, Conn. In Fig. 1 is shown one of these devices connected to a box. The features of these connectors are the screw which fastens the connector to the box and the clamp which holds the cable in place.

FIGS. 1, 2 AND 3—CONNECTORS FOR OUTLET BOXES

The screw is in a position where it is easily accessible. Three types of these connectors are being made. In Fig. 2 is shown a straight connector of galvanized cold-rolled steel. In Fig. 3 is shown a galvanized cast-iron connector bent at an angle of 45 deg. Another connector is bent at an angle of 90 deg.

Steel Switchbox

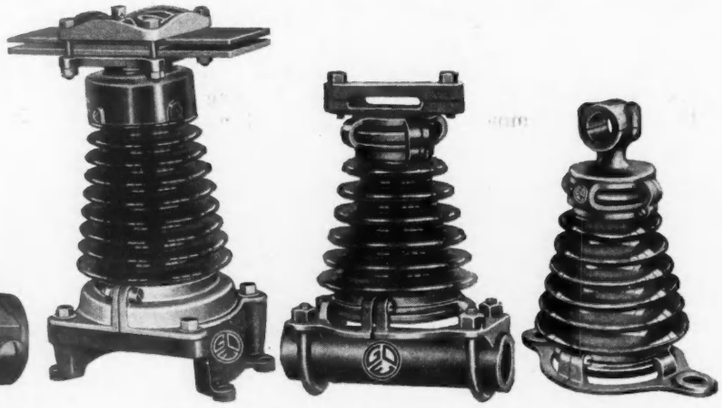
The switchbox illustrated herewith is made of a single piece of metal with corners folded and with the

WEATHERPROOF METAL SWITCHBOX

sides and hinges electrically welded. In size the box measures 8 in. by 10 in. by 5 in., and it is finished in glossy black enamel. This box is being made by the Berry-Glosser Company, Marion, Ohio.

Busbar Supports

Various kinds of pyramid-type porcelain busbar supports are being placed on the market by the General Devices & Fittings Company, Chicago, Ill. At the narrow end of these supports the corrugations are small and thin; at the other end, which is connected to the ground, they are wider and deeper. Fig. 1

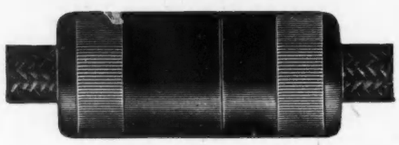


FIGS. 1, 2 AND 3—PYRAMID-TYPE BUSBAR SUPPORTS

shows a busbar support, which, although designed for 22,000 volts, will, it is said, withstand a test pressure of 112,000 volts. This support is set on an insert which may be fixed into the concrete floor of a compartment. All the metal parts except the insert are of hard bronze. The manufacturers declare that this support will hold up under a strain exceeding 1200 lb. per sq. in. Fig. 2 shows another type of busbar support equipped for holding flat buses horizontally and for mounting on a pipe frame. The support shown in Fig. 3 is designed for round buses and has a base for mounting on flat surfaces.

Insulating Cover for Connector

An insulating cover for a mechanical-conductor connector is being made by Dossert & Company, 242 West Forty-first Street, New York. The connector can be arranged to take any size of conductor from No. 4 to No. 14 inclusive, solid or stranded. A 21 per cent saving in cost is effected, the manufacturers declare, with this

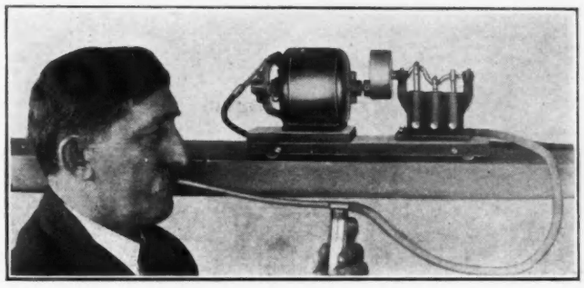


CONNECTOR WITH INSULATING COVER

connector and cover in place of the insulated connectors heretofore used for the sizes of conductors enumerated. The illustration shown herewith is approximately full size.

Motor-Driven Vacuum Pump for Dentists

A device which, it is claimed, aids considerably in the preservation of teeth and in counteracting the ravages of pyorrhea is shown in the accompanying illustration. The apparatus consists of a small vacuum pump driven by a 1/30-hp motor. A rubber vacuum



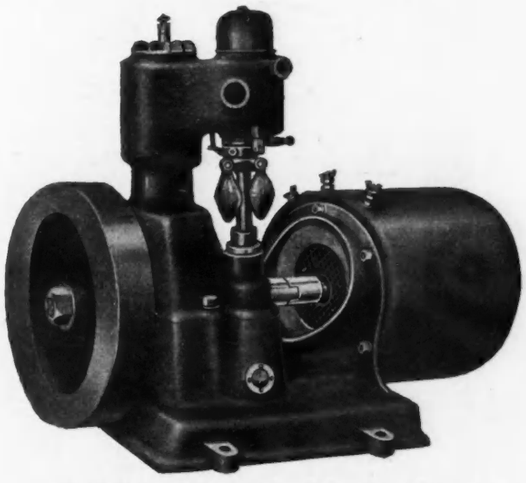
DENTIST'S VACUUM PUMP

cap fits over the teeth and gums, and an intermittent suction is created. This little machine is being made by the Sanitor Company, Chicago, Ill., and a Westinghouse motor is used in its operation.

Self-Contained Generating Unit

A so-called "silent-valve" lighting and charging outfit is shown herewith. The set is adapted for use on farms and other places where central-station service is not available. The engines employed in these outfits are of the four-stroke-cycle type and are equipped with one, two or four cylinders according to the size. The engine is directly connected to a high-speed 40-volt generator.

Tapered rotary valves with large ports for the rapid ingress and egress of gas, placed in a valve seat of corresponding taper, are used on the engine. To compensate for the variation in the size of the valve and valve seat due to heat and wear, automatic adjustment is provided. One valve is used to operate the inlet and ex-



DIRECTLY CONNECTED LIGHTING OUTFIT

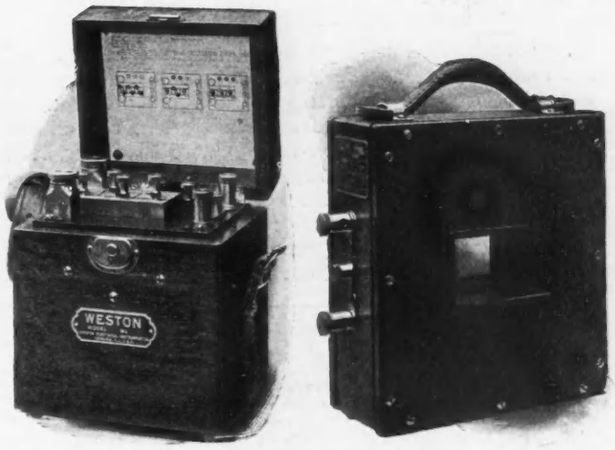
haust of one or two cylinders according to the size of the engine.

The outfit illustrated is rated at 1.5 kw with a 20 per cent overload range. The dimensions are 22 in. by 31 in. by 15 in. Engine and generator are mounted on a common base. The outfit is started from the battery, the generator acting as a motor. As soon as the engine is started the generator starts automatically to charge the battery. When the battery is charged the engine is automatically stopped.

Outfits of this type are being made in ratings of 0.75 kw, 1.5 kw and 3 kw. The E. L. Russell Company, Indianapolis, Ind., is the manufacturer of the engine of this equipment, and the generator is the product of the Robbins & Myers Company, Springfield, Ohio.

Instrument Transformers

The Weston Electrical Instrument Company, Newark, N. J., which manufactures transformers for use with its alternating-current measuring instruments, has brought out a portable series transformer of the self-contained type, in which both the primary and secondary windings constitute an integral part of the structure. On the primary side the connections are so arranged that three series of current readings are possible as follows: 10 amp, 20 amp and 40 amp; 25 amp, 50 amp and 100 amp, and 50 amp, 100 amp and 200 amp. A 5-amp secondary is used throughout. To facilitate the changes in ratio, the terminals of the windings are connected to contact blocks forming a plug switch mounted on the insulated top. A maximum of six and a minimum of three plugs are required



FIGS. 1 AND 2—SELF-CONTAINED PORTABLE INSTRUMENT TRANSFORMER

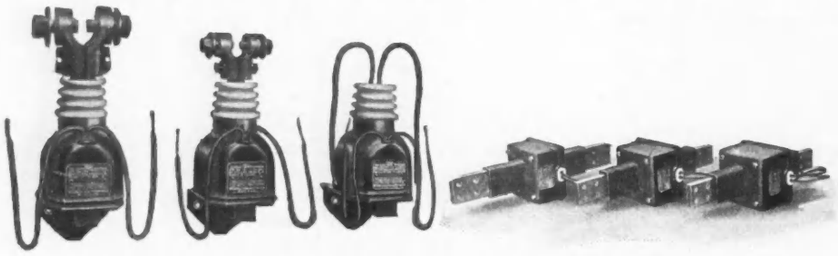
for the various ratios, and holes are provided to hold the plugs when not in use.

In Fig. 2 is shown a series transformer the secondary winding of which is alone an integral part of the structure, the primary being inserted in the transformer by the operator at the time of making a measurement. This transformer is employed for measuring currents of more than 200 amp. The rectangular box is provided with an opening as shown, through which the primary, made of a cable or busbar, may be passed. This transformer depends for its ratio upon the number of times the conductor passes through the core opening. The transformer is designed for the following ratios when the conductor passes through the opening once: 1200 amp to 5 amp, 1800 amp to 5 amp, and 2400 amp to 5 amp. When the conductor passes through the opening twice the ratios are respectively 600 amp to 5 amp, 900 amp to 5 amp, and 1200 amp to 5 amp. For any number of times N that a conductor passes through the opening the ratio is the ratio for one turn divided by N.

A current transformer for use with switchboard instruments is shown in Fig. 3. The secondary is rated at 5 volt-amp. The transformer is made in two sizes, one being suitable for use with a line potential of 2200

volts or under and the other for one of 6600 volts or under.

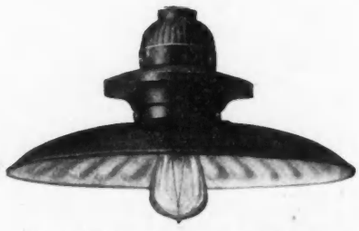
The transformer that is shown in Fig. 4 consists of a single copper busbar surrounded by a core and secondary winding inclosed in an aluminum case, which are insulated from the busbar by means of molded insulation. The busbars are drilled at the ends for connecting directly into the main circuit without auxiliary cables. The current rating of the primary ranges from 750 amp to 1600 amp. The secondary of this transformer has a rating of 5 amp.



FIGS. 3 AND 4—TRANSFORMERS FOR SWITCHBOARD INSTRUMENTS

Fluted-Dome Reflector

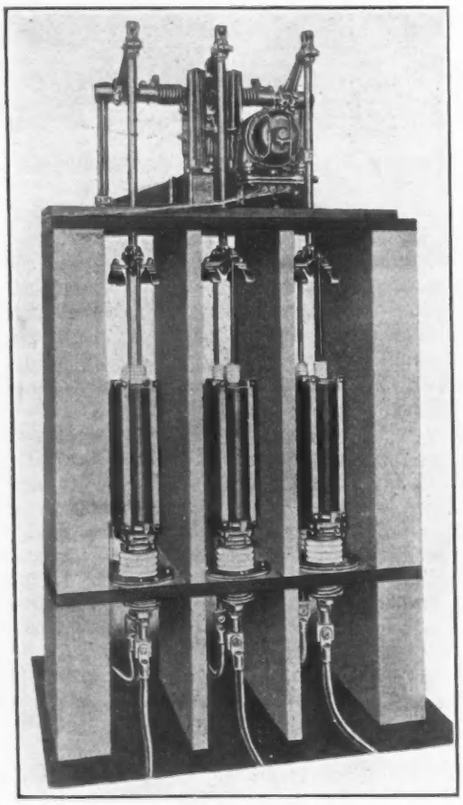
A fluted-dome incandescent-lamp reflector for use in small cities or suburban districts is shown herewith. Although street fixtures as a rule are designed to secure a wide light distribution, the outer edge of this reflector comes down lower on the lamp than usual so that it re-directs the light above the horizontal. In this way the street and sidewalk surfaces are illuminated, while the buildings, with their sleeping occupants, are kept in darkness. This fixture is being made by the Wheeler Reflector Company, 156 Pearl Street, Boston, Mass.



RESIDENTIAL-DISTRICT REFLECTOR

Motor-Operated Oil Switches

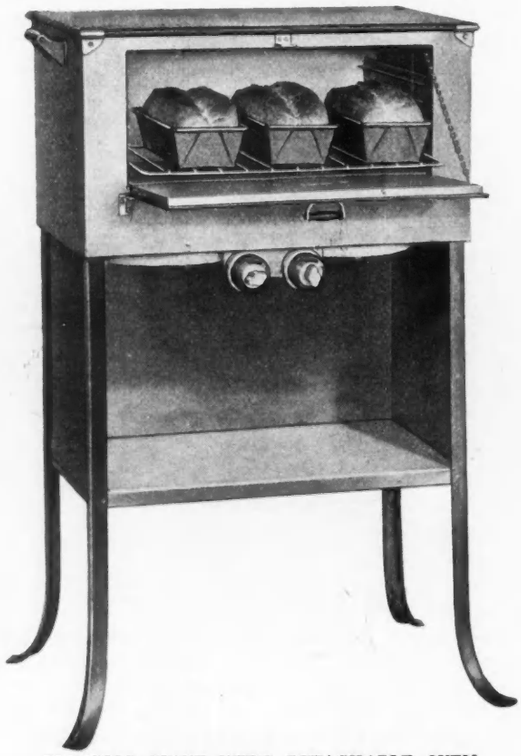
Structural changes have been made in oil switches of the motor-operated type manufactured by the General Electric Company, Schenectady, N. Y., to give readier access to the circuit-rupturing parts. The cap on the oil vessel and the lower oil-vessel clamp have also been changed so that metal straps can be bolted to the cap and the clamp. These straps hold the cap securely in place. For inspection of contacts and oil vessels switches with ratings up to 3500 volts have certain parts which are easily removable.



MOTOR-DRIVEN OIL SWITCH

Two-Burner Electric Stove

To meet the demand for a low-priced electric stove the Hughes Electric Heating Company, of Chicago, recently brought out the simple but well-built stove shown herewith. This stove is equipped with two burners, each taking a maximum of 1000 watts on high heat, 500 watts for medium heat and 250 watts for low heat. The oven is separated and in the illustration is shown in position on top of the stove. This oven is heavily insulated and is said to be highly efficient. It can be set aside easily when it is desired to use the burners for other purposes. The stove itself weighs



ELECTRIC STOVE WITH DETACHABLE OVEN

32 lb. and the oven weighs 28 lb. The total shipping weight is 75 lb. The inside dimensions of the oven are 18 in. by 8 in. by 11 in. The stove is finished in black enamel, and will, it is said, take care of the cooking requirements of a family of five persons. The low maximum demand of the stove (2 kw) should make it especially attractive from the central-station point of view. It is said that the price of the stove is well within the reach of people of moderate means.

Small Extension Cord Connector

The extension cord connector shown herewith is being placed on the market by Harvey Hubbell, Inc.,

CORD CONNECTOR

Bridgeport, Conn. The brass parts are anchored to square brass inserts molded into the composition. The current-carrying parts are not exposed.

Electric Washer

In the washing machine illustrated herewith the clothes are placed in a cylinder which, instead of revolving in the usual manner, oscillates on its horizontal axis. This motion drives the suds back and forward and subjects the clothes to a vigorous cleaning action. There is no tendency for the clothes to form into a ball, the manufacturers declare, and clothes tightly matted together when put into the cylinder become untangled. A perforated box runs along the bottom of the cylinder where the suds are practically quiet. All sand, grit and foreign matter tend to collect here and can be run off through the drain cock. The wringer is reversible and has a quick release. The cylinder is of copper and is heavily tinned inside. This washer is made by the Invincible Manufacturing Company, Pittsburgh, Pa., and is operated by a ⅛-hp Westinghouse motor.

ELECTRIC WASHING MACHINE

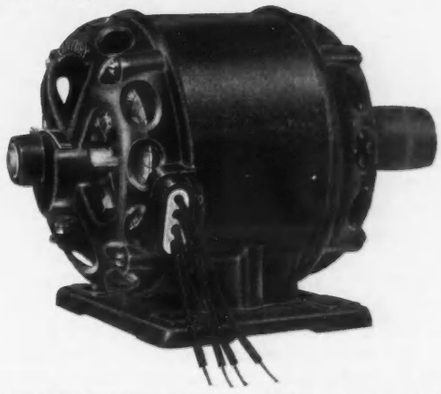
Vacuum Cleaner

A vacuum cleaner of the outside-bag type is being placed on the market by the Western Electric Company, New York. The frame is equipped with a horizontal handle which gives a convenient grip for pushing the cleaner and permits of hanging the device on the hook when not in use. The controlling switch is mounted on the handle directly beneath the normal position of the right hand.

VACUUM CLEANER WITH HORIZONTAL HANDLE

Small Single-Phase Motor

A 1/6-hp single-phase motor of the repulsion-starting, induction-running type designed to start under full load with low starting current is shown herewith. The machine can develop, the manufacturers declare, a starting torque more than two and one-half times full-load torque with a starting current less than three times the full-load current, and it can also develop a maximum torque, when it is up to speed, of approximately 200 per cent of the full-load torque. The motor is equipped with phosphor-bronze ring-oiling bearings, and it is designed to operate on 104 volts or 208 volts. This motor is being manufactured by the Century Electric Company, St. Louis, Mo.



FRACTIONAL-HORSE-POWER SINGLE-PHASE MOTOR

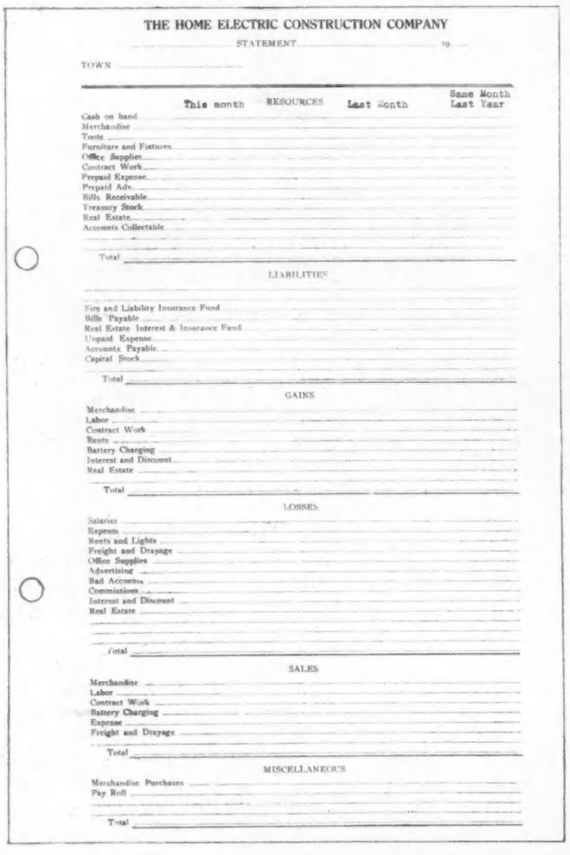
Jobber, Dealer and Contractor

CO-OPERATIVE ELECTRICAL CONTRACTING

Handling a Number of Local Businesses in Illinois Towns from a Central Executive and Clerical Office

Beginning with a single electrical contracting and merchandising store at Macomb, Ill., a few years ago, the Home Electric Construction Company has grown to be an extensive co-operative business enterprise maintaining branches in seven cities in the central part of the State.

Originally the firm did business under a different name, but in January, 1912, the Home Electric Construction Company was incorporated for $5,000. During the concern's first year an extension was made by adding a store at Bushnell, in the following year Colchester, Augusta and Rushville were included, and re-



THE HOME ELECTRIC CONSTRUCTION COMPANY

STATEMENT ..... 19..

TOWN .....

RESOURCES	This month	Last Month	Same Month Last Year
Cash on hand			
Merchandise			
Tools			
Furniture and Fixtures			
Office Supplies			
Contract Work			
Prepaid Expense			
Prepaid Adv.			
Bills Receivable			
Treasury Stock			
Real Estate			
Accounts Collectable			
Total			
LIABILITIES			
Fire and Liability Insurance Fund			
Bills Payable			
Real Estate Interest & Insurance Fund			
Unpaid Expense			
Accounts Payable			
Capital Stock			
Total			
GAINS			
Merchandise			
Labor			
Contract Work			
Rents			
Battery Charging			
Interest and Discount			
Real Estate			
Total			
LOSSES			
Salaries			
Expense			
Rents and Lights			
Freight and Drayage			
Office Supplies			
Advertising			
Bad Accounts			
Commissions			
Interest and Discount			
Real Estate			
Total			
SALES			
Merchandise			
Labor			
Contract Work			
Battery Charging			
Expense			
Freight and Drayage			
Total			
MISCELLANEOUS			
Merchandise Purchases			
Pay Roll			
Total			

FIG. 1—FORM USED BY HOME ELECTRIC CONSTRUCTION COMPANY FOR MONTHLY STATEMENT

cently arrangements have been made by which stores are now also owned and operated at Lincoln and Canton. At present the company is capitalized at $20,000, practically all of the stock being owned by officers and employees of the organization, so that the enterprise is entirely co-operative. Not only is all stock held by company employees, but practically all of the permanent employees are stockholders, only men who are hired temporarily being without a financial interest in the concern.

The table herewith shows the cities and counties in which the company is operating, and gives the population, totaling 35,026, as taken from the 1910 census, and also the names of the company's local managers. All business in the outlying territories is handled by the local managers, each of whom reports directly to Mr. W. I. Savidge, president of the company. In addition to receiving daily reports from these men, Mr. Savidge keeps in touch with the local situations by making monthly visits to each property.

Even at first glance such co-operative business methods look attractive as revenue producers, but when it is

FIG. 2—EXTERIOR OF ELECTRICAL STORE AT MACOMB, ILL.

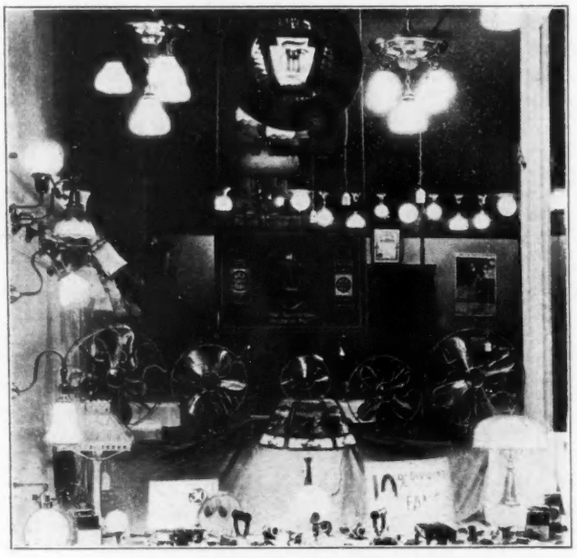


FIG. 3—STORE AT CANTON, ILL.

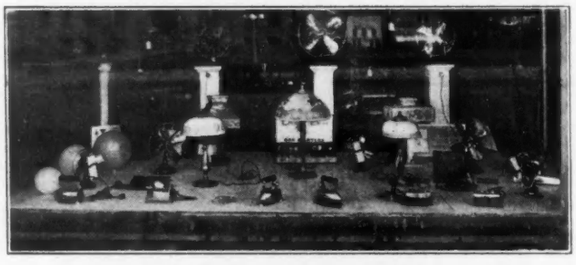
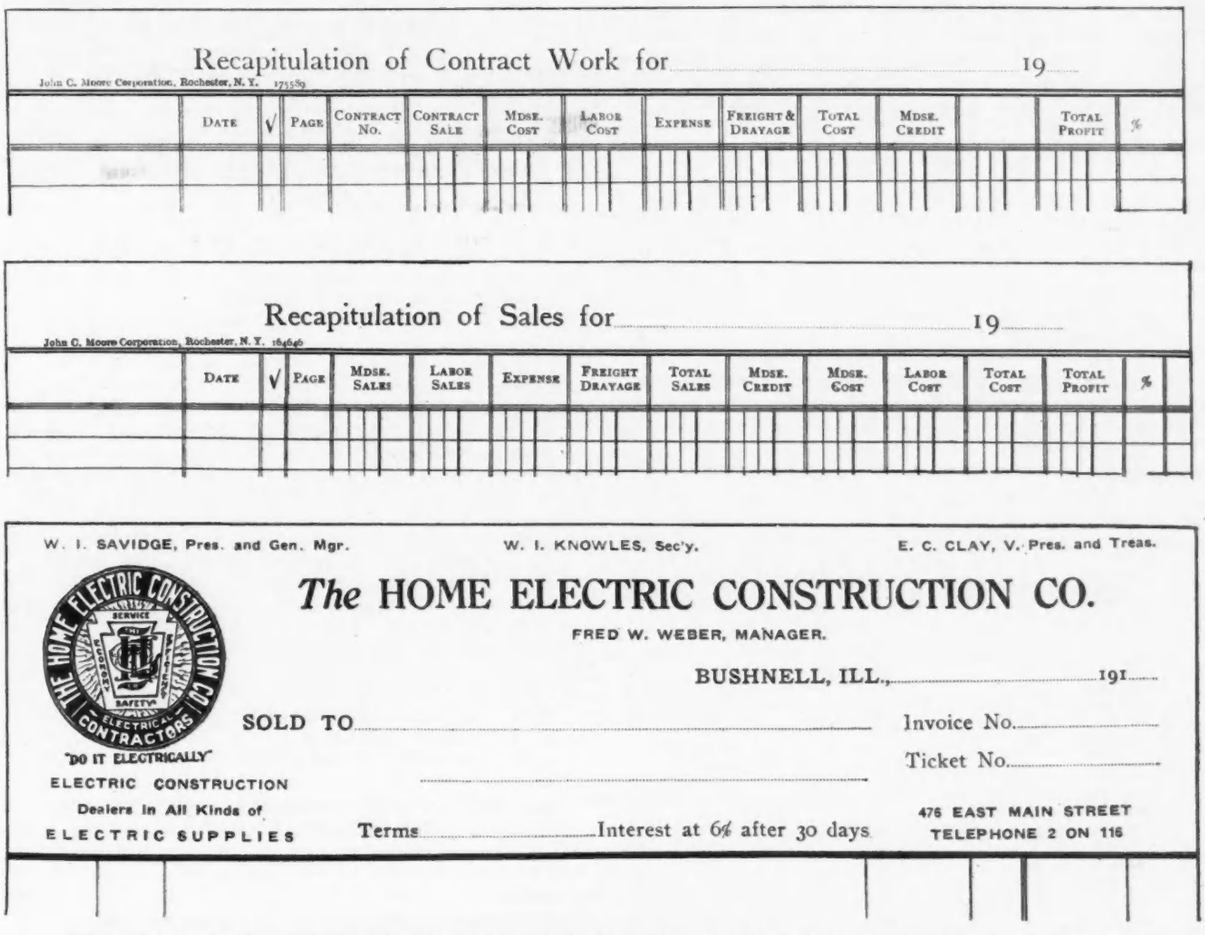


FIG. 4—WINDOW DISPLAY, LINCOLN, ILL.

considered that all business routine of billing, handling reports and bookkeeping can be carried on by a single office force on a single standard of stationery, and that buying can be negotiated at prices as low as those given to large stores, it will be seen that the plan is truly economical. In fact, in the case of the Home company the business routine for all seven stores is handled by two men and a stenographer. Aside from the saving

accomplished by purchasing in standard packages, further economy is effected by purchasing disassembled fixtures and putting them together at the home office at Macomb. In addition to all this, it should be added that the plan offers opportunity for closer co-operation with central-station companies where the cities are interconnected by transmission lines, as are five of those mentioned above. In these five towns energy is supplied by the Central Illinois Public Service Company.

On account of the unique character of the business a bookkeeping system has been devised which meets the particular needs of the company. A separate set of ledgers is kept for each local store, and as "tickets" come in from the outlying towns they are numbered and copied in triplicate on forms such as are shown here-



Recapitulation of Contract Work for ..... 19.....

John C. Moore Corporation, Rochester, N. Y. 175589

	Date	√	Page	Contract No.	Contract Sale	Mdse. Cost	Labor Cost	Expense	Freight & Drayage	Total Cost	Mdse. Credit		Total Profit	%

Recapitulation of Sales for ..... 19.....

John C. Moore Corporation, Rochester, N. Y. 164646

	Date	√	Page	Mdse. Sales	Labor Sales	Expense	Freight Drayage	Total Sales	Mdse. Credit	Mdse. Cost	Labor Cost	Total Cost	Total Profit	%

W. I. SAVIDGE, Pres. and Gen. Mgr. W. I. KNOWLES, Sec'y. E. C. CLAY, V. Pres. and Treas.

THE HOME ELECTRIC CONSTRUCTION CO. SERVICE SAFETY ELECTRICAL CONTRACTORS

"DO IT ELECTRICALLY"

ELECTRIC CONSTRUCTION

Dealers in All Kinds of

ELECTRIC SUPPLIES

The HOME ELECTRIC CONSTRUCTION CO.

FRED W. WEBER, MANAGER.

BUSHNELL, ILL., ... 191.....

SOLD TO ..... Invoice No. .....

..... Ticket No. .....

Terms ..... Interest at 6% after 30 days

476 EAST MAIN STREET

TELEPHONE 2 ON 116

FIGS. 5, 6 AND 7—RECAPITULATION SHEETS AND BILLHEAD OF HOME ELECTRIC CONSTRUCTION COMPANY

with, two copies being mailed to the town from which the original came and the third being filed in the home office. At the end of each month the two recapitulation sheets covering contract work and merchandise sales for each town show in percentage what has been done during the period. The recapitulation sheet for contract work is pink and the one for merchandise is blue. From these sheets and other data there is prepared a monthly statement setting forth under general headings an itemized list of "resources, liabilities, gains, losses, sales and miscellaneous purchases and expenditures." Alongside this column are placed corresponding figures for the preceding month and for the same month last year, presenting data from which business conditions may be readily construed.

CITIES AND COUNTIES SERVED BY THE HOME ELECTRIC CONSTRUCTION COMPANY

City	Population	County	Local Manager
Macomb	5,774	McDonough	E. C. Clay
Bushnell	2,916	McDonough	Fred W. Weber
Colchester	1,445	McDonough	George Rippetoe
Augusta	1,146	Hancock	W. C. Wheeler
Rushville	2,422	Schuyler	George Glossop
Lincoln	10,890	Logan	Herbert B. Hamline
Canton	10,433	Fulton	R. B. Wallace

As an adjunct to the bookkeeping the company has also worked out a short cut for the classification of the time of the men. Besides being a great time and labor saver, this short cut permits of easy checking. The classification of time is itself of value in figuring the prepaid expense on pending contracts.

The officers and directors of the Home Electric Construction Company are: President, Mr. W. I. Savidge; vice-president and treasurer, Mr. E. C. Clay; secretary, Mr. William I. Knowles; directors in addition to officers, Messrs. Herbert B. Hamline, Fred W. Weber and George Rippetoe.

As an indication of the progressive spirit with which the business of the company is conducted it may be mentioned that the Home Electric Construction Company is said to be the first contracting firm to publish regularly a monthly bulletin for distribution to its trade.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

New Equipment for Alloy Company.—The Electrical Alloy Company, Morristown, N. J., is adding equipment in both its wire-drawing and rolling departments, materially increasing the capacity of its plant.

Motor-Driven Polishers.—Roth Brothers & Company, Chicago, Ill., have received an order from the Western Clock Company, La Salle, Ill., for twenty-seven electrically operated polishers, twenty of these machines being rated at 5 hp and seven at 1.25 hp. This equipment is an addition to thirty-two polishers already in operation.

Electric Steering Gear on Greek Battleship.—The first installation of electric steering gear made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., in use on a foreign warship is that on the Greek battleship *Kilkis*. This ship was purchased from the United States and was formerly the *Mississippi*. The *Kilkis* is reported to have arrived safely at Athens.

Electric-Vehicle Demonstration.—A number of engineers and automobile and newspaper men were recently entertained by the Buffalo Electric Vehicle Company at Buffalo, N. Y., and were taken on a demonstrating trip over the country roads to Clarence, N. Y. A 1915-model, five-passenger electric coupé was driven up and down steep hills and over rough ground with satisfactory results.

Washing-Machine Firm Adopts Motor Drive.—The Meadows Manufacturing Company, Pontiac, Ill., which has been making washing machines for about five years, is now bringing out a motor-driven washer. Machines previously made by the company were mostly of the type operated by gasoline or steam engines, and consequently were arranged with a pulley for belt drive. The new machine is driven by a 1/5-hp motor.

Platinum in Germany.—In a report to the American Institute of Metals, presented at Chicago on Sept. 8, Mr. Carl F. Woods, of Boston, said that extensive deposits of platinum have been discovered in Germany during the last year. The platinum is present in the form of an alloy which, unlike pure platinum, is soluble in acid and therefore has been previously overlooked in the analysis and separation of the metals.

Railroads' Retrenchments Bad for Bucket Manufacturers.—On account of the general curtailment of expenses by the railroads, the Hayward Company, 50 Church Street, New York, manufacturer of motor-driven buckets, is finding business rather dull at present. Much of the demand for these buckets comes from the railroads and allied industries, and an improvement will depend, it is said, on an advance in freight rates.

"South American Special."—In order to educate the manufacturers regarding the possibilities of the South American market, the Lehigh Valley Railroad Company will, it is reported, make up a "South American special," which will stop at all the principal cities along its lines, and financial and commercial experts will distribute all available information concerning South American trade and the tariffs of the various countries.

Motor-Driven Office Appliances Prevalent at Chicago Business Show.—Of the many mechanical devices on display at the Chicago Business Show and Efficiency Exposition, Sept. 5 to Sept. 12, practically all were motor-driven, the old-line typewriter companies being conspicuous among the few remaining advocates of manual power. With the constantly growing array of office aids, office buildings should continue to rise in the list of desirable central-station loads, and increased attention will need to be given to securing ample wiring and outlet facilities.

South American Demand for Sockets.—A large number of sockets used in South America are of German make, but because of the present war supplies from Germany have been cut off, and it is expected that the manufacturers in this country will in large part make up the deficiency. A New York agent for a prominent maker of sockets declares that the German product has been much cheaper than American-made material, although of an inferior quality, and manufacturers heretofore have not been able to compete successfully with the Germans on that account.

English Electrical Company Evincing Patriotic Spirit.—The members of the staff and works of the British Thomson-Houston Company, Ltd., are answering the call of their country for volunteers. Up to the present 852 have answered the call. It is the company's intention to pay half wages to those of its employees who have enlisted. The company further promises wherever possible to reinstate returning employees in their former positions on the cessation of hostilities. Lord Kitchener has sent a letter through Major-General Rawlinson to the managing director expressing his appreciation of the company's attitude.

Importer of German Products Well Stocked.—The Kandem Electric Company, 49 East Twenty-first Street, New York, which has been receiving its material from the Koerting & Mathiessen Company in Germany, has on hand a stock of various types of flaming-arc lamps and accessories which, it is expected, will last nine months. It was stated incorrectly in the *Electrical World* of Sept. 12 that the stock on hand was practically exhausted. The company was contemplating introducing a new line of products, but on account of the war no shipments could be made, although a large amount of material was already packed and about to be sent out from Germany. The Kandem company is affiliated with an importing company in Canada handling the Koerting & Mathiessen products and can exchange supplies with this company in case of a shortage. The Koerting & Mathiessen Company is also connected with an English company which is rapidly completing a new plant and which will be able to supply the American companies with material in the near future.

Electricity at Foundrymen's Show.—Ingenious automatic electric control and numerous applications of motor drive marked the machinery exhibits at the conventions of the allied foundry association at Chicago, Sept. 8 to 11. Of the electrical equipment interesting to foundrymen, standard motor-driven machine tools, electric lighting, hoisting and welding apparatus occupied a large part. There were, however, several motor applications to sand mixers and riddles which were especially adaptable to foundry practice. Among the electric companies having displays were the Benjamin Electric Manufacturing Company, Chicago; the James Clark, Jr., Electric Company, Louisville, Ky.; the Electric Controller & Manufacturing Company, Cleveland; the General Electric Company, Schenectady; the International Electric Tool Company, Milwaukee; the Shepard Electric Crane & Hoist Company, Montour Falls, N. Y.; the United States Electrical Tool Company, Cincinnati; the Westinghouse Electric & Manufacturing Company, Pittsburgh, and the Wisconsin Electric Company, Racine, Wis.

Gear Manufacturers Busy.—The New Process Gear Corporation, Syracuse, N. Y., is working overtime to keep up with a volume of business larger than any heretofore handled. Although the plant was doubled in capacity less than two years ago and was at that time said to be the largest in the world devoted exclusively to gear making, an additional building is now being erected, and the capacity of the case-hardening and heat-treating departments will again be doubled. Additional equipment already ordered

for fall delivery includes the following: Ten Fellows gear shapers, fifteen Gleason bevel-gear generators, three Bullard vertical turret lathes, three Heald grinders, one Landis grinder, two National "acme" automatic machines and numerous special machines built according to designs worked out by engineers of the company. The total production of the plant in spur, spiral and bevel metal gears and "New Process noiseless" gears and pinions will after Jan. 1, 1915, it is said, be in excess of 1,000,000 per year.

Demand for Electrical Apparatus in Greece.—According to Consul-General A. W. Weddell, stationed at Athens, there is a demand in Greece for electric motors, generators, fans, irons, toasters, etc. In many lines of trade, the consul-general states, the American exporter has not paid sufficient attention to the potentialities of the Greek market.

Boston Edison Company Operations.—A gain in income of about $643,000, or more than 10 per cent, is reported by the Edison Electric Illuminating Company of Boston in its returns to the Massachusetts Gas and Electric Light Commission for the year ended June 30, 1914, in comparison with 1913. The company's total income from the sale of electricity was $7,008,288, the principal items being commercial lighting, $4,627,300; municipal arc lighting, $592,004; municipal incandescent lighting, $274,337; motor load, $1,272,268; energy sold to street railways, $165,708, and electricity sold to other companies, $76,671. The number of customers on motor circuits increased from 8465 to 9201 in the thirty-nine municipalities supplied, and the total number of customers increased from 52,447 to 62,194. At the close of the fiscal year the company had 4803 stockholders compared with 4435 a year ago, and the total cost of all the plant was $40,903,229, or about $5,000,000 more than in 1913. The cost of plant exceeded the company's capital and loans by $14,148,329. During the year dividends of 12 per cent on the par value of the stock were disbursed, these dividends amounting to $2,252,319. The total liabilities on June 30 were $43,864,270, the profit and loss balance (surplus) being $146,577. There are now 1766 employees, as against 1475 last year. The principal operating expenses for the year were: Station expenses, $1,242,062; distribution cost, $845,178; office expenses and management, $776,476; taxes, $785,713, the total, including miscellaneous, being $3,989,491. The operating ratio was 57 per cent. The company now owns seventy-nine boilers, all of the water-tube type, aggregating 38,088 hp; twenty-six steam engines and turbines aggregating 140,600 hp, and it has 10,400 kw in direct-current and 91,000 kw in alternating-current generators. The bulk of the generation is by steam turbines, there being nine available for service with an aggregate rating of 109,400 hp. The physical plant includes 45,890 wooden poles, 1,885,205 ft. of underground conduit, 5175 line transformers, and 67,098 meters. The company owns 101 motor-generator sets and has numerous substations in which these are operated. Fourteen storage batteries are listed. During the fiscal year the company generated 188,723,854 kw-hr., compared with 171,783,312 kw-hr. last year. It sold 130,653,669 kw-hr. to commercial customers, including 29,605,381 kw-hr. to motor users, 9,542,968 kw-hr. to street railways, 4,197,917 kw-hr. to other customers, and 73,050,219 kw-hr. to metered lighting and power installations. The maximum load was 63,131 kw, on Tuesday, Nov. 16, 1913, and during the year the company burned 179,364 tons of coal, the average cost per ton used and accounted for being $3.92, as against $3.80 last year.

NEW YORK METAL MARKET PRICES

	Sept. 9	Sept. 16
Copper:		
Prime Lake	12.45 to 12.55†	12.40 to 12.60†
Electrolytic	12.20 to 12.30†	12.10 to 12.20†
Casting	12.15 to 12.25†	12.00 to 12.10†
Copper wire	13.75 to 14.00	13.50 to 13.75
Lead	3.90	3.90
Nickel	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter	8.50	8.50
Spelter, spot	.... to 5.80	5.40 to 5.50
Aluminum, 98 to 99 per cent.	19.50 to 20.50	19.00 to 19.50

COPPER EXPORTS

Total tons to Sept. 15	8,788

†Nominal.

NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

Corporate and Financial

Federal Light & Traction Company's Bonds.—The Columbia Trust Company, New York, as trustee, has called for proposals for the sale of $27,123 of first-lien sinking-fund gold bonds of the Federal Light & Traction Company of New York at a price which shall not exceed 102 per cent and interest.

New York Stock Exchange Listings.—The New York Stock Exchange has listed the following securities: $571,000 additional refunding and extension mortgage bonds of the Union Electric Light & Power Company, St. Louis, Mo., and $429,000 additional of the same bonds upon official notice that they have passed beyond control of the company; $1,305,000 additional Milwaukee (Wis.) Electric Railway & Light Company general and refunding mortgage bonds, series "A," and $695,000 additional of the same bonds upon official notice that they have passed beyond the control of the company; and $1,064,000 additional Portland (Ore.) Railway, Light & Power Company first and refunding sinking-fund mortgage convertible bonds, series "A."

Augusta-Aiken Defers Preferred Dividend.—The directors of the Augusta (Ga.)-Aiken Railway & Electric Corporation have sent the following letter to the stockholders announcing the deferment of the preferred stock dividend: "During the first six months of the current year your company's earnings showed a surplus of $61,170, this being an increase of $10,008, or 19.7 per cent, over that of the corresponding period of 1913. Careful estimates for the last six months of 1914 indicate a surplus of $25,000. The total surplus for the year, therefore, is expected to be about $90,000, which is the amount of the annual dividend on your company's preferred stock. It is estimated that the net earnings for the last six months of 1914 will be more by approximately $38,000 than for the corresponding period of 1913, but the surplus will show a decrease of about $40,000. This decrease is caused by additional taxes and fixed charges of $78,612, due to the taking over the new hydroelectric plant of the Georgia-Carolina Power Company on the Savannah River, at Stevens Creek, on July 1, 1914, under contracts made in 1911. These additional charges are made up as follows: Taxes, $7,106; interest on bonds of Georgia-Carolina Power Company, $68,750; miscellaneous interest, $2,756, totaling $78,612. At the time this hydroelectric development was projected, some three years ago, your company was confronted with the necessity of providing additional power to supply its increasing business and for expected future growth, but the business depression prevalent in this country for many months past has led owners of cotton mills and other industries to postpone the equipment of their mills and factories for operation by electric power. Therefore your company's revenue from sale of energy will, for the current year at least, be less than anticipated. During the first six months of this year your company has expended for revenue-producing extensions and betterments the sum of $51,404, and further expenditures for the same purpose will be necessary during the last six months of this year. Ordinarily these expenditures would be in large part financed by the sale of your company's bonds, but financial conditions render this impossible at present. For these reasons and because of the general disorganization occasioned by the unexpected outbreak of the war in Europe, your directors consider it necessary to conserve all available cash resources, and therefore deem it for the best interest of the stockholders to suspend payments of preferred stock dividends until financial and general business conditions are such that these payments can be resumed without weakening your company's cash position. The earnings of your company have steadily improved, and in the judgment of your directors the expected development of your property is only deferred, and they believe it to be only a question of time when the additional business will be secured for which the large investment in the new hydroelectric plant and in other new business extensions was made. Your company's property is in excellent physical conditon, its relations with its employees are harmonious, and a general spirit of co-operation exists between the public and the company. Attention is called to the fact that dividends upon the preferred stock are cumulative at the rate of 6 per cent per annum."

THE FAR WEST FOR JUNE

Returns from 70 Per Cent of the Central-Station Industry of the Pacific and Mountain States for June Show a Marked Falling Off in Business in Comparison with Previous Months

The returns which have been received by the *Electrical World* for the month of June from the central-station companies of the Pacific and Mountain States, while they show an increase over 1913, do not show such large increases for June as they did for May. And, as was shown in our issue of Aug. 15, the returns for May were behind those for April, so far as growth was concerned. However, this falling off has in no way been caused by the war. These results

TABLE I—JUNE RETURNS FROM COMPANIES IN SIX LARGE CITIES IN CALIFORNIA, WASHINGTON, OREGON, UTAH AND COLORADO, REPRESENTING OVER 60 PER CENT OF INDUSTRY OF PACIFIC AND MOUNTAIN STATES

Income Derived from Sale of Energy			Energy Output in Kw-hr.		
June, 1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
$1,639,297	$1,559,596	5.1	140,494,562	129,504,858	8.5

happened before Austria-Hungary had sent her ultimatum to Servia. They were solely the results of local conditions. It is not to be inferred, however, that the Western companies are any weaker than the Eastern companies. It just so happens that the Western companies are more affected by local conditions than are the Eastern companies.

Large Cities Gain, Small Cities Lose

Tables I and II were compiled to show the status of the large cities and the small cities. The six large cities are the six largest cities in this territory from which the *Electrical World* is receiving returns, and the six small cities are the six smallest in this region from which we receive returns. The large cities are mostly coast cities, and the small cities are inland cities. The large cities represent an output of 60 per cent of the total output of the Pacific and Mountain States, while the small cities represent less than 1 per cent. Five out of the six large cities showed growth, with an aggregate result for the six of approximately $80,000 increase in income and 10,000,000 kw-hr. increased output. The one

TABLE II—MAY AND JUNE RETURNS FROM COMPANIES IN SIX SMALL CITIES IN NEW MEXICO, ARIZONA, WASHINGTON, WYOMING AND IDAHO, REPRESENTING LESS THAN 1 PER CENT OF THE INDUSTRY OF THE PACIFIC AND MOUNTAIN STATES

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	$55,828	$54,103	3.3	1,613,341	1,770,549	*9.7
June	54,753	55,596	*1.5	1,262,268	1,645,528	*30.0

*Decrease.

large city to show a decrease has been showing a decrease for the last few months.

Four out of the six small cities showed a decrease both in output and income. One city showed a decrease in income but an increase in output, which was put down by the manager of the central station to development work in the fall of 1913. Of the other companies, one reported having sold part of its transmission line inasmuch as a certain large company which had previously bought wholesale energy had discontinued doing so, owing to improvements on its own property. The other companies were largely engaged in furnishing energy for irrigation work. The demand this year for energy for that purpose was not so great as it was in 1913. Last year was a very dry year and irrigation was the cause of a great growth with many a central station. The decreases, however, were not very large and show, therefore, an increase in other types of load.

Pacific States Still Grow

The companies in the three States of California, Oregon and Washington, while they do not show such large increases for June as for previous months, nevertheless do show a state of strength. Irrigation loads have not been so heavy this year as last, owing to more rain. Moreover, during June business was particularly dull on the Pacific Coast.

TABLE III—JUNE RETURNS FROM OVER 60 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE PACIFIC STATES OF CALIFORNIA, WASHINGTON AND OREGON

Income Derived from Sale of Energy			Energy Output in Kw-hr.		
June, 1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
$1,329,041	$1,251,956	6.2	110,466,824	102,761,475	7.6

All of the industries had retrenched as far as was possible. The three Pacific States represent practically the entire industry of both Pacific and Mountain States. As is seen from Tables III and IV, 60 per cent of the industry of the Pacific States is almost triple 80 per cent of the industry of the Mountain States (excluding Montana).

The returns from the Mountain States show a small increase. In some cases, however, the increase would have been much more gratifying had the rates of 1913 been in vogue in 1914. No returns were received this month from

TABLE IV—JUNE RETURNS FROM OVER 80 PER CENT OF THE CENTRAL STATION INDUSTRY OF THE MOUNTAIN STATES OF COLORADO, NEW MEXICO, UTAH, ARIZONA, WYOMING, NEVADA AND IDAHO (MONTANA EXCLUDED)

Income Derived from Sale of Energy			Energy Output in Kw-hr.		
June, 1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
$565,846	$539,962	4.8	44,859,631	39,074,902	14.8

Montana. This State has a monthly output in the neighborhood of 40,000,000 kw-hr.

June Falls Behind May

With 70 per cent of the central stations showing an aggregate increase of approximately $100,000 and an output increase of 15,000,000 kw-hr. for June, no fear need be shown for the stability of these companies. This would mean an increase in income for the whole industry of approximately $125,000 and an increase in output of over 20,000,000 kw-hr. Turning to the returns for May from 60 per cent of the industry of this region, we find an increase in income of approximately $100,000 and an increase in output of more than 15,000,000 kw-hr. Figuring on this basis, the whole industry

TABLE V—RETURNS RECEIVED BY THE ELECTRICAL WORLD FOR MAY AND JUNE FROM THE CENTRAL-STATION INDUSTRY OF THE PACIFIC AND MOUNTAIN STATES

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May (60 per cent of industry)	$1,525,729	$1,426,885	7.0	144,839,552	129,357,915	11.9
June (70 per cent of industry)	1,894,887	1,791,918	5.8	155,326,455	141,836,377	9.6

for this region in May would have shown an increase of almost $170,000 and an output increase of over 25,000,000 kw-hr. In other words, May was ahead of June in increased business by over $40,000 income and over 5,000,000 kw-hr. output. While the two months are not so strictly comparable as we have assumed them to be, they are, however, close enough to make rough comparisons.

Business Notes

The Green Engineering Company has transferred its main office from 28 East Jackson Street, Chicago, Ill., to East Chicago, Indiana.

The Munning-Loeb Company, Matawan, N. J., has appointed C. G. Backus to be in charge of its New York office at 50 Church Street.

The Goulds Manufacturing Company.—E. B. Gould is now connected with the Chicago office, 3801 South Ashland Avenue, of the Goulds Manufacturing Company, Seneca Falls, N. Y.

The Waverley Company.—F. Temple has taken over the business of the Waverley Company, Indianapolis, Ind., in Chicago, and the company's factory branch in Chicago has been closed.

Blair & Nathan.—R. S. Blair and A. F. Nathan have entered into partnership as counselors-at-law with offices at 55 Liberty Street, New York. The firm will confine its practice to the soliciting and litigating of patents and trademarks. D. G. Haynes will be associated with the firm.

The Kermel Apparatus Company, Cambridge, Mass., has appointed Charles A. Barker, formerly with the Westinghouse Electric Manufacturing Company, a district sales manager of New York State and contiguous territory, with headquarters at 708 Monroe Street, Brooklyn, N. Y.

New Industrial Companies

The Hammond Electric Bank Protection Company, of Los Angeles, Cal., has been incorporated with a capital stock of $500,000 by W. D. and B. N. Hammond, C. K. Berg, F. C. Mason and A. L. Brown.

The Geyser Electric Water Heater Company, of Brooklyn, N. Y., has been incorporated with a capital stock of $10,000 by L. B. Funk, D. M. Cohn and David Horwitz, 719 Eastern Parkway, Brooklyn, N. Y.

The Roechling Electro Steel Company, of New York, N. Y., has been chartered with a capital stock of $30,000 to deal in electro steel. The incorporators are M. Opp, M. A. Hills, of New York, N. Y., and R. T. Conahan, of the Bronx.

The Finsen Electric Motor Manufacturing Company, of Rochester, N. Y., has been incorporated by William Weyrauch, R. Corydon Cash and Henry R. Howard, of Rochester, N. Y. The company is capitalized at $10,000 and purposes to manufacture, repair and deal in electric motors, machinery, etc.

Trade Publications

Reading Lamp.—An electric floor-stand lamp is described in a leaflet published by the Federal Sign System (Electric), Chicago, Ill.

Steel Cabinets.—Steel cabinets and switch boxes are described and listed in a leaflet published by the Berry-Glosser Company, Marion, Ohio.

Electric Washer.—A so-called "safety power" washer is the subject of a leaflet published by the Meadows Manufacturing Company, Pontiac, Ill.

Oil Engines.—Heavy-duty oil engines are described and illustrated in a catalog issued by the Wygodsky Engine Company, 115 Broadway, New York.

Electric Lantern.—An electric lantern operated by four dry cells is the subject of a leaflet issued by the Federal Sign System (Electric), Chicago, Ill.

Tungsten-Lamp Fixtures.—A booklet entitled "Mazda Lighting Fixtures Multiple" has been issued by the General Electric Company, Schenectady, N. Y.

Turbo Blower.—Turbo blowers for undergrate draft are the subject of a booklet issued by the Coppus Engineering & Equipment Company, Worcester, Mass.

Motion-Picture Machines.—A motion-picture machine suitable for amateurs is described in a bulletin issued by the Pathéscope Company, Æolian Hall, New York.

Outlet-Box Connnectors.—Three types of outlet-box connectors are described and illustrated in a leaflet issued by the Gillette-Vibber Company, New London, Conn.

Galvanometer.—A high-sensitivity galvanometer of the D'Arsonval type is the subject of Bulletin No. 228 issued by the Leeds & Northrup Company, Philadelphia, Pa.

Lighting Fixtures.—The Crown Electrical Manufacturing Company, St. Charles, Ill., has issued a catalog containing numerous illustrations and price lists of lighting fixtures.

Reversible Split Knobs.—A leaflet describing reversible split knobs of the round and square type has been put out by the Findlay Electric Porcelain Company, Findlay, Ohio.

Electric Products.—The Menominee Electric Manufacturing Company, Menominee, Mich., is distributing a 156-page catalog completely describing the products of the company.

Lighting Fixtures.—Bulletin 3210, recently issued by the George Cutter Company, South Bend, Ind., describes and illustrates Sol-Lux fixtures for nitrogen-filled tungsten lamps.

Wireless Telephone.—A short-distance radiotelephone set is the subject of a circular issued by the Marconi's Wireless Telegraph Company, Ltd., Marconi House, Strand, London, W. C.

Lighting Fixtures.—So-called "Sol Lux" fixtures for high-efficiency tungsten lamps are described and illustrated in Bulletin No. 3210 issued by the George Cutter Company, South Bend, Ind.

Sectional Switch Boxes.—Metal sectional switch boxes designed for use with non-metallic flexible and rigid conduit are described in a leaflet issued by the Chicago Fuse Company, Chicago, Ill.

Lighting Outfit.—A so-called "silent-valve" engine is described in two booklets issued by the E. L. Russell Company, Indianapolis, Ind., and the method of connecting it directly to a generator is given.

Electric Ranges and Hot Plates.—In circulars recently issued by the Copeman Electric Stove Company, Flint, Mich., various types of electric ranges and hot plates are described and illustrated.

Storage Battery for Motorcycles.—Bulletin Z issued by the Electric Storage Battery Company, Philadelphia, Pa., contains information on a small so-called "Exide" battery designed for motorcycle service.

Rigid Conduit.—List prices are given of rigid conduit, couplings and elbows in a leaflet issued by the Safety-Armorite Conduit Company, Pittsburgh, Pa., agent for the National Tube Company, Pittsburgh, Pa.

Luminous Heater.—A so-called "El Radio" luminous heater with a polished-copper reflecting surface is described and illustrated in a folder published by the Hotpoint Electric Heating Company, Ontario, Cal.

Fixture Parts.—Fixture parts and trimmings for electric and gas lamps are described and illustrated in a handsome 131-page catalog put out by the Plume & Atwood Manufacturing Company, Waterbury, Conn.

Small Lighting Plants.—The Main Electric & Manufacturing Company, Pittsburgh, Pa., has issued a catalog containing information on gas-engine-driven lighting plants, lighting fixtures and cooking appliances.

Big Creek Initial Development.—The Stone & Webster Construction Company, Boston, Mass., has issued an attractively illustrated book describing the Big Creek initial development of the Pacific Light & Power Corporation.

Electric Products for South America.—Catalog No. 21 issued by Pass & Seymour, Inc., contains information in Spanish, Portuguese and English on the various products of the company, and has been printed primarily for South American trade.

Street-Car and Store Lighting.—Bulletin No. 43,404 issued by the Edison Lamp Works of the General Electric Company, Harrison, N. J., contains papers and discussions on street-car lighting read before a meeting of the New England Street Railway Club. Bulletin No. 43,403 published by the same company contains a reprint of an article appearing in the *Lighting Journal* entitled "Store Lighting with Edison Mazda Lamps."

Personal Mention

Mr. B. F. Robbins has become vice-president and manager of the Hunterdon Electric & Power Company, High Bridge, N. J., relieving Mr. Knox Taylor, president of the organization, of managerial duties.

Mr. O. F. Whitehurst, formerly vice-president of the Capital Light & Power Company, Jackson, Miss., is now consulting engineer for the Chattanooga & Tennessee River Power Company, Chattanooga, Tenn.

Mr. F. M. Houston has been appointed commercial manager of the Lockport (N. Y.) Light, Heat & Power Company. Mr. Houston was formerly connected with the Elmira (N. Y.) Water, Light & Railroad Company.

Prof. Frank B. Wilson, for the past three years assistant professor of electrical engineering at the University of Illinois, has been appointed head of the electrical department at Wentworth Institute, Boston, Mass.

Mr. C. J. Edwards has superseded Mr. William Spaulding as treasurer and manager of the Coast Power Company, Tillamook, Ore., which formerly operated under the name of the Tillamook Electric Light & Fuel Company.

Mr. Fred Cats, formerly superintendent of generating stations for the Nevada-California Power Company and Southern-Sierras Power Company, Bishop, Cal., is now superintendent of patrol for these organizations.

Mr. A. Patterson, formerly electrical engineer with the Fort Smith (Ark.) Light & Traction Company, is now general superintendent of the Southwestern Gas & Electric Company, with headquarters at Texarkana, Tex.

Mr. J. W. Disbrow has been appointed to succeed Mr. M. V. Knapp as superintendent of the Pennsylvania Power Company at Ellwood City, Pa. He was formerly connected with the Union Electric Company of Pittsburgh.

Mr. L. L. Ferree, formerly foreman of the line department of the Harrisburg (Pa.) Light & Power Company, has been promoted to be superintendent of the same company to fill the vacancy left by Mr. Edgar Z. Wallower.

Mr. George B. Thomas has been appointed manager of the Interstate Public Service Company and the Franklin (Ind.) Water, Light & Power Company, subsidiaries of the Middle West Utilities Company, as successor to Mr. F. H. Miller.

Mr. M. V. Knapp, for a number of years superintendent of the Pennsylvania Power Company at Ellwood City, Pa., has been transferred to the plant of the Mahoning & Shenango Valley Railway & Light Company at Youngstown, Ohio.

Mr. William Mohr, who has been assistant to the late R. J. McCuen, superintendent of lamps and lighting in Baltimore, Md., will succeed his chief as acting superintendent. Mr. Mohr has been in this department for more than twelve years.

Mr. J. C. Sexton, formerly superintendent of the municipal water and electric plant at Grayville, Ill., is now operating a plant at Indianola, Miss., which he and his brother, Mr. J. M. Sexton, have purchased. Mr. J. M. Sexton was formerly connected with the Union Electric Light & Power Company, St. Louis, Mo.

Mr. W. J. Ferris, receiver for the Idaho-Oregon Light & Power Company, Boise, Idaho, has been confined to his home for some time with a broken leg, but he expects to be able to place the New Oxbow plant in operation before the receiver's sale on Sept. 30. Mr. Ferris was formerly president and general manager of the La Crosse (Wis.) Water Power Company, whose plant was burned last year.

Mr. Frank Wert, Philadelphia, Pa., has been made head of the department of public relations of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, as successor to Mr. H. D. Mamington, who will now devote his entire time to his duties as assistant to the president. Mr. Wert has been engaged in newspaper work at Philadelphia, Baltimore and Harrisburg, and is particularly well equipped to handle that part of his new work which involves contact with the press.

Mr. W. L. Davis, formerly assistant secretary and assistant treasurer of the Texas Power & Light Company and affiliated companies, was recently appointed superintendent of accounts of the Strickland-Goodwin Management Association, of Dallas, Tex., succeeding Mr. J. R. Wolfe, assigned to other duties. The Strickland-Goodwin Syndicate owns and operates the lines of the Texas Traction Company, consisting of the interurban lines between Dallas and Denison, Tex., and lines in McKinney, Sherman and Denison, and the Southern Traction Company, which operates the interurban system between Dallas and Waco and Corsicana, also city lines in Waco, Corsicana and Waxahachie, consisting in all of about 300 miles of road through the "Black Belt" of Texas.

Mr. E. L. Franklin, formerly results engineer for the southwest district of the Doherty Operating Company, has been appointed manager of the Trumbull Public Service Company, of Warren, Ohio. Born at Wolfville, Nova Scotia, only two miles from the home of Longfellow's "Evangeline," Mr. Franklin received his common-school education in Canada and was graduated from McGill University at Montreal in 1902. The next ten years were spent at Easton, Pa., where he was successively chief engineer and superintendent of the Easton Power Company, secretary and superintendent of the Easton Gas & Electric Company and general superintendent of the Eastern Pennsylvania Power Company, as these companies succeeded each other. In 1912 he joined the staff of the Doherty Operating Company, being engaged in work at its various properties in Missouri, Oklahoma, Kansas and Nebraska until his recent transfer to Warren.

Dr. Edward Weston, although perhaps best known to the present generation of electrical men as the founder of the science of accurate electrical measurements and as a manufacturer of electrical instruments, has been a pioneer in many other branches of the electrical field, and is distinguished as a scientist, engineer and versatile inventor. Dr. Weston was born at Bryan Castle, England, May 9, 1850. In 1870 he left England and came to the United States. His first work of importance in America was with the American Nickel Plating Company, for which he developed many improvements. In 1872 Dr. Weston's experiments resulted in the construction of the first electroplating machine. He later improved the electric dynamo by introducing the laminated core. Dr. Weston has had much to do with the development of incandescent and arc lamps. He originated the method of squirting a filament from plastic carbonaceous material, and he was one of the first to advocate the rating of lamps upon their mean spherical candle-power. In 1884 he discovered a new resistance alloy which he called "manganin." Four years later he founded the Weston Electrical Instrument Company, which now has extensive manufacturing buildings and laboratories at Newark, N. J. The Weston cadmium cell was adopted by the International Electrical Commission in 1908 as the international standard of electromotive force. The honorary degree of LL.D. was conferred on Dr. Weston by McGill University in 1903. In 1904 he received the honorary degree of Sc.D. from Stevens Institute, and the same degree was conferred upon him by Princeton in 1910. Dr. Weston is a charter member and a past-president of the A. I. E. E. and is a member of many other scientific and engineering societies both here and abroad.

DR. EDWARD WESTON

Obituary

John J. Scheidel, Jr., for three years employed in the New York office of Henry D. Sears under Mr. C. L. Hight, died on Sept. 15, aged twenty-four. Mr. Scheidel was Mercury on the recent champion New York degree team of the Jovian Order. Prior to his connection with Henry D. Sears he was with the W. F. Irish Electric Company, New York.

Construction

New England

DIXFIELD, MAINE.—Because of the greater demand for energy than the Dixfield Lt. & Improvement Co. is able to supply, it will sell its plant to the Rumford Falls Pwr. Co., it is reported. The latter company furnishes energy to manufacturers in Rumford, Me.

BURLINGTON, VT.—The commissioners of this city have adopted resolutions to place street lamps between Pomeroy and Archibald Streets and on Spring Street between Walnut and Elmwood Avenues.

FITCHBURG, MASS.—The Putnam Machine Co. is making extensive additions to its electric equipment. The Hibbard Elec. Co., Fitchburg, Mass., has been awarded a contract for $20,000 to cover this work. French & Hubbard, Boston, are the architects and consulting engineers for the new buildings. Energy will be purchased from the Connecticut River Transmission Co.

LYNN, MASS.—Plans are being considered for extensions to the ornamental street-lighting system. Present plans provide for the erection of lamps on Blake and Willow Streets.

READING, MASS.—Local extensions are contemplated to the municipal electric-light plant, to cost about $8,000.

SHIRLEY, MASS.—The Shirley El. Co. has been granted pole locations on Shaker Road, where the company proposes to erect a high-tension transmission line from the Wilds Road to a point near the Samson Cordage Works, for the purpose of supplying electricity to operate the cordage works, to the amount of 300 hp. A transformer station, it is reported, will be erected in the mill yard.

TAUNTON, MASS.—The committee on public works and franchises has recommended additional street lamps for General Sherman Street and other thoroughfares.

MANCHESTER, CONN.—The new lighting system was put in operation on Sept. 9. The improvement in street lighting was initiated by the Manchester Business Men's Association, whose members have pledged themselves to pay one-half of the cost for five years, the city to pay the other half. The establishment of the new system was made the occasion of a celebration.

UNIONVILLE, CONN. — The County Commissioners have granted the Union El. Lt. & Pwr. Co., of Unionville, permission to erect a 22,000-volt transmission line in Farmington, from Knott's Corners to Avon. The proposed line is to extend from Unionville through Hartford to Wethersfield, and will transmit energy generated at the plant of the Hartford El. Lt. Co. in Hartford.

Middle Atlantic

DUNKIRK, N. Y.—The Board of Water Commissioners is considering the question of extending the municipal electric transmission lines to the plant of the Ornamental Heater Co. and entering into a contract with the company to furnish electricity to operate the plant.

MEXICO, N. Y.—The Public Service Commission has granted the Mexico El. Co. permission to issue $41,000 in capital stock, the proceeds to be used for extensions and improvements to its plant and transmission line. The company proposes to extend its lines from Mexico to the villages of Vermilion, Clifford, Palermo and Arthur.

NEW BERLIN, N. Y.—The New Berlin Lt. & Power Co. has just completed a new concrete boiler house and has installed a new 125-hp boiler and a 100-hp Harrisburg Ideal engine.

NEWBURGH, N. Y.—The Public Service Commission has granted the Central Hudson Gas & El. Co., of Newburgh, permission to make two extensions to its system and for the exercise of two new franchises, one in the town of Wappinger, Dutchess County, and the other in Hamptonburg, Orange County.

SENECA FALLS, N. Y.—It is reported that ground has been broken for the Tracey Development Company's plant, which is to generate electricity for Waterloo, Seneca Falls, Auburn, Geneva and several towns in Wayne County. The contract for excavations and erecting the power house was let to Grant, Smith & Co., Chicago, now in charge of the barge canal work from this place to Seneca Falls, and involves an expenditure of $100,000. The building will be provided with the latest type machinery and will be thoroughly up to date.

SODUS, N. Y.—On Sept. 9 the Wayne Pwr. Co., of Sodus, started its service in Naples, connection being made with the 11,000-volt transmission line from Atlanta. The company is now serving Naples, Atlanta, North Cohocton, Cohocton, Wallace and Avoca. G. R. Mills is president.

BOYERTOWN, PA.—The Boyertown El. Co. is installing a 300-kw, 60-cycle, 2300-volt General Electric generator and a three-panel switchboard. A. E. Groff is superintendent.

CONEMAUGH, PA.—Several new boilers are being installed in the municipal lighting plant.

DUBOIS, PA.—The Dubois El. & Trac. Co. is contemplating extensions to its electric-light service and street-railway system. The company recently installed a 300-kw generator and switchboard. An electric railway, it is reported, will be built from Falls Creek to Coal Glen by the Jefferson Coal Co., which will connect with the system of the Dubois Lt. & Trac. Co.

EMAUS, PA.—Bids will be received by the school board of the borough of Emaus until Sept. 23 for the construction of a new Public School building on North Street, between Fifth and Sixth Streets. Separate bids will be received at the same time and place for complete heating and ventilating system, plumbing system and complete installation of electrical work, in accordance with plans and specifications prepared by E. M. Pickin, Hunsicker Building, Allentown, Pa. C. F. Wagner is secretary of school board.

FRANKFORD, PA.—Plans have been adopted by the Frankford Board of Trade for an ornamental street-lighting system in the business section of the city.

HIGH SPIRE, PA.—The Borough Council is considering the question of lighting the streets of the borough by electricity.

JOHNSTOWN, PA.—An effort is being made by the business men on Main Street, between Franklin and Clinton Streets, to secure the installation of ornamental street lighting in their section of the city.

LANCASTER, PA.—The ordinance requiring electric wires to be placed underground within a year has been passed by the City Council.

NEW CASTLE, PA.—Plans are under way for the erection of a curb lighting system along Washington Street from County Line Street to Greenwood Avenue. The contract will be awarded within the next few weeks.

TITUSVILLE, PA.—The municipal electric-light plant has recently been completely overhauled. Fred C. Johnson is electrician and Herbert A. Holstein is city manager.

WILLIAMSBURG, PA.—The new power plant of the Penn Central Lt. & Pwr. Co. will be formally opened next week. The plant is said to have cost $1,000,000.

LEBANON, N. J.—The installation of an electric-lighting system in Lebanon is under consideration. It is proposed to secure the service from the Hunterdon El. & Pwr. Co., of High Bridge.

BALTIMORE, MD.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 6 for miscellaneous repairs to mechanical equipment and construction changes at the United States appraisers' stores, Baltimore, Md. For details see proposal columns.

TOWSON, MD.—The contract for the installation of mechanical equipment, including heating, plumbing and power plants, for the Maryland State Normal School, near Towson, has been awarded to Riggs, Distler & Stringer, engineers and contractors, 23 Light Street, Baltimore. The contract amounts to approximately $75,000 and covers the installation of 600-hp water-tube boilers, ice machines, pumps, automatic stokers, vacuum heating system, etc.

LOGAN, W. VA.—The Logan County Lt. & Pwr. Co., it is reported, will build a new power house (concrete, brick and steel building, 100 ft. by 84 ft., 55 ft. high), with brick chimney and coal-handling apparatus. New equipment, including 500-hp water-tube boilers, two 2500-kw turbines, pumps, condensers, etc., will be installed. Bids, it is understood, have been received for construction of power house. Proposals for machinery will be asked for later. The company also proposes to erect about 75 miles of 44,000-volt transmission lines and will furnish electricity to coal mines in the Logan field. Francis R. Weller, Hibbs Building, Washington, D. C., is engineer.

PARKERSBURG, W. VA.—W. L. Waters, of Pittsburgh, has made an inspection of the Little Kanawha River, and it is said that he has proposed to the United States government to improve the stream with locks and dams to Burnsville for the concession of the water-power rights. Burnsville is situated in one of the richest coal regions of the State. Mr. Waters is said to represent Eastern capital. It is estimated that $12,000,000 would be required for the improvements contemplated.

RICHMOND, VA.—The Department of Street Cleaning would like to receive information pertaining to the latest improved motor street-sweeping machinery, both large and small, American and foreign makes. This information to be delivered to the office of the superintendent of the Department of Street Cleaning as soon as possible. Henry J. Cohn is superintendent.

WASHINGTON, D. C.—Proposals for wire cable, metallic tapes and rubber packing will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until 10.30 a.m. Sept. 30. Blanks and general information relating to Circular 868 may be obtained from that office or the office of the assistant purchasing agents, 24 State Street, New York City. Major F. C. Boggs, corps of engineers, U. S. A., is general purchasing officer.

WASHINGTON, D. C.—Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until 3 p. m. Sept. 29, for furnishing and installing new lighting fixtures and repairing old fixtures in the United States Court House and Post Office Building, New York, N. Y., in accordance with the specifications and drawings, copies of which may be had at the office of the supervising architect, O. Wenderoth, Washington, D. C., or at the office of the supervising chief engineer, New York, N. Y. See advertisement in proposal columns.

WASHINGTON BARRACKS, D. C.—Bids will be received at the Engineer Depot, United States Army, Washington Barracks, D. C., until Sept. 28, for furnishing one motor-driven ventilating fan coupled to and driven by a 110-volt, three-phase, 60-cycle squirrel-cage induction motor. For further information address Lt.-Col. Joseph E. Kuhn.

North Central

ANN ARBOR, MICH.—The Eastern Michigan Edison Co. has been awarded a five years' contract for furnishing energy to the boulevard ornamental lighting system which has recently been installed by the merchants of the city.

BATTLE CREEK, MICH.—The contract for construction of an electric railway to connect Coldwater and Battle Creek (28 miles long) has been awarded to J. T. Adams, contractor, of Columbus, Ohio.

BLISSFIELD, MICH.—Fifty-three taxpayers have petitioned the City Council for day service from the municipal electric-lighting plant.

FENTON, MICH.—Plans are being considered for the installation of an ornamental lighting system in Fenton.

GRAND RAPIDS, MICH.—The State Railroad Commission has granted the Citizens' Tel. Co., of Grand Rapids, permission to issue $100,000 in bonds, the proceeds to be used for improvements to its plant and equipment.

MARQUETTE, MICH.—The new Jones furnace is to be equipped with an electric power plant. Four motors aggregating 50 hp will furnish the required energy. J. T. Jones is manager.

MENOMINEE, MICH.—The Menominee & Marinette Lt. & Trac. Co. is now building a fireproof repair shop and paint shop with 2300 ft. of floor space. Edward Daniell is general manager.

MILFORD, MICH.—Within the next two months the Milford El. Co. expects to erect a short transmission line using 16,000 ft. No. 0 bare copper wire, cross-arms, etc. Among contemplated purchases are one 150-kva direct-connected vertical water-wheel-type generator, three-phase, 60-cycle, 2300-volt, 164-r.p.m., and exciter, one 200-hp waterwheel for 16-ft. head, 164 r.p.m., 40 in., and one governor for above turbine, with the necessary switchboard equipment; also two 25-kw transformers. C. C. Sherk is superintendent.

MIO, MICH.—The Au Sable Power Co. has commenced the construction of its fourth dam on the Au Sable River. The new dam will be of similar construction to the others now in operation. The station will be equipped with generators having a total rating of 6000 kw.

SAGINAW, MICH.—It is reported that a petition has been presented to the City Council asking that the proposal to issue bonds be submitted to the people for the erection of a municipal electric-light plant.

BLANCHESTER, OHIO.—Preparations are being made by the Board of Public

Affairs to change the municipal electric-light system from single-phase, 133-cycle, 110-volt, alternating current, to three-phase, 60-cycle, 110 volt, as soon as possible. Bonds to the amount of $5,000, it is understood, have been issued for the work. H. E. Katzenmeyer is clerk of board.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, Ohio, until Sept. 25 for weatherproof copper wire. Specifications may be secured at the office of the light and heat division, 1443 East Third Street, Cleveland.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, 513 City Hall, Cleveland, until Sept. 23 for furnishing lighting fixtures for the new city hospital group. Specifications may be obtained at the office of the city architect, 420 City Hall, Cleveland.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, 513 City Hall, Cleveland, until Oct. 7 for three low-lift steam-turbine reduction-gear-driven centrifugal pumps for division pumping station for the Department of Public Utilities, division of water, 413 Superior Avenue.

CLEVELAND, OHIO.—Bids will be received at the office of the clerk of the Board of Education, East Sixth Street, Cleveland, Ohio, until Sept. 21 for furnishing material and work necessary to complete the remodeling of electric wiring at the East High School, at East Eighty-second Street, corner of Decker Avenue, N. E., in accordance with plans and specifications on file in the office of the architect of said board. S. G. Hogan is director of schools.

COLUMBUS, OHIO.—Bids will be received by Samuel A. Kinnear until noon of Oct. 12 for furnishing and erecting motor-driven centrifugal pumping machinery for the main sewage pumping station. Specifications are on file in his office. Bids will be received for pumps of capacities of 15,000,000 gal., 10,000,000 gal. and 5,000,000 gal. per hour. Prices for labor and material must be stated separately as well as in lump sums.

MANSFIELD, OHIO.—Bids will be received by C. H. Hughes, director of public safety, until Sept. 23 for furnishing and installing a police signal system.

MARBLEHEAD, OHIO.—The Marblehead Pwr. Co. will probably purchase within the next six months the equipment for a six-mile, 2200-volt, single-phase transmission line. G. W. Lapp is electrical engineer.

MIDDLETOWN, OHIO.—Permission has been granted to the Colin-Gardner Paper Co., it is reported, to erect a new rotary house. The company is also planning to erect a new power house, which will be equipped with automatic stokers.

NORWALK, OHIO.—The Cleveland, Southwestern & Columbus Ry. Co., which furnishes electrical service in Norwalk, has submitted a proposal to the City Council offering to furnish energy to operate the proposed municipal electric-light plant for a period of five years, or longer if desired. The company also offers to sell the city such portion of its distributing lines, equipment, transformers, meters, etc., as the city may wish at a price to be mutually agreed upon, and if an agreement cannot be arrived at the price shall be determined by arbitration. The company agrees to discontinue its present contract (which does not expire for another year) as soon as the city equips its own distributing system, provided that it is given the contract to furnish electricity for same. Bonds to the amount of $120,000 have been authorized for the installation of a municipal plant.

NORWOOD, OHIO.—The Board of Control has awarded the Harrisburg Fdy. & Machine Wks., of Harrisburg, Pa., the contract for two Corliss engines (460 hp each) at $10,049. The Allis-Chalmers Co., of Milwaukee, was awarded the contract for two 355-kw generators, at $8,700, for the municipal electric-light plant.

PIQUA, OHIO.—The Miami Lt., Ht. & Pwr. Co. is preparing to erect single-lamp standards on the principal streets of Piqua.

PLAIN CITY, OHIO.—At a special session of the City Council it was voted to issue bonds for $6,500 to repair the light and water plant. Bonds of $500 each are to be issued, running for a period of three years, with interest at 5½ per cent, payable semi-annually.

SANDUSKY, OHIO.—The City Council has decided to submit to the voters of this city the question of a $200,000 bond issue for a municipal lighting plant. This action is said to be a result of the controversy with the city officials on the lighting rates for the city. H. Whitford Jones, of Cleveland, it is reported, will be retained to prepare plans if the bond issue is carried.

URBANA, OHIO.—The Urbana Lt. Co. is contemplating extending its service to Woodstock. The company is now operating a transmission line to North Lewisburg and may extend the line to Woodstock.

URBANA, OHIO.—The Board of Control has selected the five-lamp cluster system for lighting the business section of the city. The plans provide for 24 standards, which will replace the arc lamps now in use. The lamps will be installed by the Urbana Lt. Co.

YOUNGSTOWN, OHIO.—Improvements will be made at the Lowellville power house of the Mahoning & Shenango Ry. & Lt. Co. and considerable equipment added to take the place of that recently destroyed by fire. Instead of rebuilding the separate substations, the company will install a new permanent substation at Lowellville and increase the rating of the plant. A large amount of heavy machinery has already been delivered to the company.

HUNTINGTON, IND.—Hearings continue to be held on the bids for the new municipal lighting plant. The street-lighting situation and the desirability of changing from the old arc lamps to the magnetite type have been thoroughly discussed. After further consideration a decision will be made.

PORTLAND, IND.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 19 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Portland. Drawings and specifications may be obtained at the above office or from the custodian of site at Portland. O. Wenderoth is supervising architect.

BLOOMINGTON, ILL.—The Bloomington & Normal Ry. & Lt. Co. is rebuilding its engine and will erect a transmission line from Chenoa to Lexington, material for which has been purchased. M. G. Linn is superintendent.

FAIRFIELD, ILL.—The City Council of Fairfield plans the installation of an additional generator in the municipal electric-light plant for taking care of the day load.

GALVA, ILL.—The new plant of the Galva Electric Lt. Co. is now completed. The building is of brick, 96 ft. by 56 ft. The installation consists of two large boilers of 204 hp and a heavy-type Corliss engine which operates a 250-kw generator. Plans are under way to install a second unit similar to the first. In addition to supplying energy to Galva, the following cities will be served: Oneida, Altona, Lafayette, Cambridge and Bishop Hill. E. O. Brown is vice-president and manager and H. C. Pollitz is secretary and treasurer.

SPRINGFIELD, ILL.—An ordinance providing for 30 arc lamps to be erected in the outlying districts has been submitted to the City Council.

SPRINGFIELD, ILL.—The Springfield Gas & El. Co. has erected a transmission line to the Tuxhorn Mine to furnish energy there. The equipment consists of one 100-kw motor generator set and three 30-kw, 6600/440 volt transformers. At present electricity will be used to operate the underground haulage apparatus and mining machines; electricity will be used later for hoisting machinery. Roscoe Woltz is commercial power engineer.

STERLING, ILL.—It is reported that the city has entered into a five-year contract with the Illinois Northern Utilities Company to light its streets. The new schedule calls for $19.50 per lamp per annum as compared with $16.50 on the old contract. The number of lamps has also been increased from 250 to 270.

BARRON, WIS.—The city of Barron is making additions to its distribution system and changes in arc-lamp street-lighting system, material for which has been purchased. M. H. McKee is city clerk.

HARTFORD, WIS.—Improvements have recently been made to the municipal electric-light plant consisting of the installation of a 450-hp cross-compound Allis-Chalmers engine, a 375-kva generator and a Western Electric switchboard. H. Parfrey is superintendent.

MONDOVI, WIS.—Within the next two months the Mondovi El. Lt. & Pwr. Co. expects to erect 20,000 ft. of new line, and plans to purchase alternators, switchboards, oil engines, exciters, switches and a water-wheel governor. A. D. Alt is secretary and treasurer.

NEW RICHMOND, WIS.—It is understood that the Wells El. Const. Co. will erect an electric-light plant here. A. S. Wells is manager.

OAKFIELD, WIS.—Within the next year the Oakfield Lt. & Pwr. Co. expects to purchase some transformers, lightning arresters and meters. W. E. Bristol is secretary.

SHARON, WIS.—The United Ht., Lt. & Pwr. Co., expects to purchase within the next three months one 60-kva or 70-kva generator, 2300 volts, three-phase, 60-cycle, directly connected to a 13-in. by 12-in. side-crank Ideal engine; a 6-kw regulator for series lighting; switchboards, instruments, etc. The village of Sharon is taking over the pole line of the United Ht., Lt. & Pwr. Co., of Delavan. Leon C. Le Baron is superintendent of the water and light department of Sharon.

SHAWNEE, WIS.—The municipal electric light and water plant expects within the next year to erect a water-power plant that will develop 400 hp or install an engine of about 300 hp. Paul E. Caprano is superintendent and chief engineer.

CEYLON, MINN.—Bids for the labor and material required in the construction of an electric-light system here will be received until 8 p.m. Sept. 24. Plans and specifications are on file in the office of F. H. Koenecke, village recorder, and also in the office of Earle D. Jackson, consulting engineer, St. Paul, Minn.

FRANKLIN, MINN.—The Whorland El. Lt. Co. is reported to have been granted a franchise to furnish electricity for lamps and motors in Franklin.

HIBBING, MINN.—The installation of a municipal electric-light plant in Hibbing is reported to be under consideration.

PIPESTONE, MINN.—If plans of the Pipestone El. Lt. Co. mature, energy will be transmitted by this company to Trosky, Edgerton and Jasper.

SOUTH STILLWATER, MINN.—The Consumers' Power Co., of St. Paul, Minn., is planning to extend its lines to this place.

WACONIA, MINN.—Plans are being considered, it is reported, for the installation of an electric-lighting system in Waconia.

HARRIS, IA.—Bids will be received until 8 p.m. Sept. 22 for the construction of a substation, overhead distribution system, and for furnishing meters, transformers and lamps. L. J. Hagerty, town clerk.

PATON, IA.—Bids will be received by the town of Paton until Sept. 22 for construction of proposed transmission line and distribution system, in accordance with plans and specifications on file in the office of the city clerk at Paton and at the office of W. H. Grover, of Ames, engineer. Separate bids are to be submited for the substation to be erected in Paton.

BUTLER, MO.—Extensions and improvements will be made to the municipal electric-light plant next year, including the installation of two three-phase, 60-cycle, alternating-current generators, switchboard and instruments. Extensions will be made to the distribution system, for which copper wire, poles, insulators, etc., will be required. Improvements will also be made to the water-works system, equipping the same with electrically operated machinery. H. M. Cannon is manager.

CORDER, MO.—It is probable that the proposal of the lighting plant at Higginsville to serve Corder with energy will be accepted.

KIRKWOOD, MO.—The Board of Aldermen has authorized improvements to the municipal electric-light plant, involving an expenditure of $17,000. The Board of Public Improvements will have charge of the work

PALMYRA, MO.—It is reported that the Arrow Engineering Co., St. Louis, Mo., has been awarded the $28,500 contract for new equipment and rebuilding of the electric-light plant and water-works. The generators, switchboard and motors will be of General Electric make. Bonds for the sum of $26,000 for the new work were taken by the Continental Trust Co., of Chicago.

CONDE, N. D.—The people of Conde are agitating the question of an electric-light plant.

DAVIS, S. D.—A franchise, it is reported, has been awarded to a Milwaukee company to install and operate an electric-light plant in Davis.

FLANDREAU, S. D.—The Flandreau Lt. & Pwr. Co. expects to purchase within the next eight months one 150-hp producer-gas engine and one 100-kva, 2300-volt engine-type alternating-current generator.

ALLIANCE, NEB.—Plans are under way for the erection of an electric-light plant at this place. A. C. Arends is interested.

WYMORE, NEB.—The new electric-light plant will soon be in operation. The equipment is said to have cost $15,000.

KANSAS CITY, KAN.—The commissioners are offering $202,500 in bonds for improvements to the municipal electric-light plant.

PAWNEE ROCK, KAN.—The electric-light plant has been temporarily closed pending the securing of a purchaser who will combine the lighting of the town with the manufacture of ice.

Southern States

HENDERSONVILLE, N. C.—The Hendersonville Lt. & Pwr. Co. has just completed the development of its No. 2 water-power, which will soon be placed in operation. R. M. Oates is president.

SNOW HILL, N. C.—The Town Board has purchased equipment for an electric-light plant, which will be installed at once. The proposed plant will cost about $4,100 and will be driven by a 35-hp oil engine.

WASHINGTON, N. C.—Contracts have recently been awarded for improvement to the water, light and sewerage system. The equipment will include two 500-kw Curtis turbines, two 250-hp Babcock & Wilcox boilers, two 750-gal. compound fire pumps; also the construction of a 500,000-gal. reservoir. H. B. Charles is superintendent.

MICANOPY, FLA.—The new electric-lighting plant has recently begun operation. This plant was constructed by the J. B. McCrary Company, Atlanta, Ga.

OCALA, FLA.—The proposal to issue $57,000 in bonds for extensions to the municipal electric-light system and for construction of ice plant will be submitted to the voters on Oct. 27.

TAMPA, FLA.—City Engineer Ed. Fitzgerald has recommended the installation of a central fire-alarm and police signal system.

JELLICO, TENN.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 14 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Jellico, Tenn. Drawings and specifications may be obtained from the above office or from the custodian of site at Jellico. O. Wenderoth is supervising architect.

SHELBYVILLE, TENN.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 13 for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Shelbyville, Tenn. Drawings and specifications may be obtained at the above office or from the custodian of site at Shelbyville. O. Wenderoth is supervising architect.

CLEARWATER, ARK.—At an election held Aug. 25 the proposal to grant a franchise to C. H. Evans and others to install an electric-light plant was defeated.

CORNING, ARK.—Preparations are being made to rebuild the local electric-light plant, which was recently destroyed by fire. Plans for the equipment are not yet completed, but will probably include one 300-kw to 350-kw and one 150-kw, two-phase, 60-cycle, 2300-volt generator; also switchboard, transformers, etc. H. B. Hays is engineer in charge of the work. George A. Booser is interested in the company.

LITTLE ROCK, ARK.—The Arkansas Lt. & Pwr. Co., recently incorporated with a capital stock of $650,000, will have its main office in Little Rock, but will operate in the cities of Arkadelphia, Camden, Malvern, Magnolia and other places. The company is successor to the Arkansas Pwr. Co., which is building a power plant at Malvern. H. C. Couch is president, and J. L. Longino is secretary, both of Little Rock.

MELVILLE, LA.—Plans and specifications have been prepared by W. L. Thompson, consulting engineer, of Boyce, for the installation of a municipal electric-light plant in Melville.

NEW ORLEANS, LA.—Steps have been taken by the merchants of Camp Street for the installation of ornamental lamps on Camp Street from Canal Street to Howard Avenue. The Electrical Supply Co. is interested in the project.

PLATTENVILLE, LA.—Furnishing electricity for lamps and motors on the bayou between Donaldson and Lockport, La., a distance of about 56 miles, in connection with a proposed electric interurban railway, is under consideration by Walter Ohlmeyer, of Plattenville; Dr. H. S. Smith, Albert Boudreaux and Alfred Picot, of Thibodaux, La. It is proposed to organize a company to be known as the Louisiana Ry., Lt. & Pwr. Co.

CUSHING, OKLA.—Within the next three months the Cushing El. Lt. & Pwr. Co. expects to purchase a 300-kw turbine set with jet condenser, and a return-tubular boiler, 18 in. by 72 in. H. Askin is vice-president.

BEAUMONT, TEX.—The Beaumont El. Lt. & Pwr. Co. is making extensive improvements in its plant, approximating $100,000.

SMITHVILLE, TEX.—The Smithville El. Lt., Wtr. & Pwr. Co. has recently purchased two 150-hp Ames high-pressure boilers and one 18-in. by 36-in. Hamilton Corliss engine, all of which will be erected at once. The company expects to purchase a new switchboard within the next three months. Emil Buescher is proprietor.

Pacific States

MONTESANO, WASH.—It is reported that the Northwest Elec. & Wtr. Wks. is making plans to improve the service during the coming year so that it will be adequate to meet the demands of the city.

SPOKANE, WASH.—It is reported that the Pacific Tel. & Tel. Co. will expend $20,000 in extensions and improvements to its system in the various sections surrounding Spokane. Work has already commenced.

WILBUR, WASH.—The Washington Wtr. Pwr. Co., of Spokane, has been awarded a contract by the City Council for furnishing electric service to this city. It is understood that some extensions and improvements will be made.

ASTORIA, ORE.—It is reported that the Marconi Wireless Tel. Co. will immediately erect a large wireless station here. Four steel towers will be erected on a concrete foundation. The station will be a 25-kw plant and will probably cost $80,000.

DRAIN, ORE.—The city of Drain is installing an electric distribution system. The equipment will consist of one General Electric switchboard (three phase, 60 cycles), with ammeter and circuit switch; three ammeters, one voltmeter, two autoline switches, transformers, 100 40-ft. poles and 20 miles of wire, and 48 80-watt incandescent street lamps. The work will be done by the city. Electricity for operating the system will be furnished by the Douglas County Lt. & Wtr. Co., of Roseburg. John W. Hogg, of Sutherlin, is engineer in charge of the work.

LINDSAY, CAL.—The installation of an ornamental street-lighting system in Lindsay is under consideration. The Mount Whitney Pwr. & El. Co. is reported to have offered to donate the electroliers.

LOS ANGELES, CAL.—Specifications have been submited by the city electrician to the Board of Public Works for the proposed ornamental lighting system for Mariposa Avenue between Romaine Street and Melrose Avenue.

SAN FRANCISCO, CAL.—The San Francisco Hotel Association has petitioned the supervisors' lighting committee to order the installation of sixty electroliers in Third Street, from Market to King Street, which were purchased by subscription.

SAN FRANCISCO, CAL.—Sealed proposals will be received at the office of the lighthouse inspector, San Francisco, Cal., until 2 p.m. Sept. 29 for furnishing duplicate internal-combustion engines with directly connected air compressors, about 30 hp each. Blank proposals and particulars may be obtained by addressing the lighthouse inspector, San Francisco, Cal.

SAN JOSE, CAL.—The Inyo-Cerro Gordo Mining & Pwr. Co., of San José, recently incorporated, has applied to the State Water Commission for water rights on Lone Pine Creek. The company contemplates a 1500-hp development. Energy generated at the plant will be used to operate the machinery in the mines and tramway. F. J. Hambly is president.

TULARE, CAL.—Plans are being prepared for the construction of a new substation for the Mount Whitney Pwr. Co., just east of Tulare.

BOISE, IDAHO.—The city of Boise has canceled the contract which has been held with the Idaho-Oregon Light & Pwr. Co. for installing lamps and furnishing energy for lighting the streets of South Boise. It is said that the city has decided to install its own system.

PLUMMER, IDAHO.—Dunkit Brothers, of this city, were recently granted a certificate of public convenience and necessity by the Public Service Commission at Boise for the installation of an electric plant. It is understood that work on the project will begin within 60 days.

WHITEFISH, MONT.—The city clerk will shortly receive bids for installing an electric-light plant here.

WIBAUX, MONT.—Henry Zophi, of this city, has applied for a franchise to install an electric light and heating plant. Mr. Zophi and others associated with him will invest about $20,000 in the work, it is reported. It is proposed to furnish 24-hour service.

PUEBLO, COL.—Steps have been taken by the Central Pueblo Improvement Association for the installation of an ornamental street-lighting system on Union Avenue.

LAS CRUCES, N. M.—The Las Cruces El. Lt. & Ice Co. expects to purchase within the next four months (provided it is possible to make the necessary financial arrangements) a 250-hp Diesel-type oil engine for belt connection with a 150-kva alternator at 600 r.p.m. D. W. Morgan is manager.

PORTALES, N. M.—Within the next 12 months the managers of the municipal electric-light plant expect to purchase poles, transformers, meters and various electrical appliances, including heating and cooking apparatus, vacuum cleaners, washing machines, etc. W. H. Braley is town clerk.

Miscellaneous

JUNEAU, ALASKA.—The Speel River Pwr. Co., which recently obtained a government grant for the construction of a hydro-electric chemical and power plant on the Speel River, 35 miles south of here, will begin work within the next few months, according to E. P. Kennedy, of Seattle, who is said to be promoting the project.

PANAMA.—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Sept. 30, for furnishing steel wire cable, files, drill sleeves, etc. Blanks and general information relating to this circular (No. 868) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal.

New Incorporations

PLEASANTON, KAN.—The Pleasanton Electrical Pwr. Co. has been incorporated with a capital stock of $10,000.

BEATTYVILLE, KY.—The Beattyville Utilities Co. has been incorporated with a capital stock of $10,000 by T. B. Bkajey, of Beattyville; H. S. Van Zant, of Frankfort, and E. Pearce Bullock, Jr., of Louisville.

LOUISVILLE, KY.—The United States Utilities Co. has been chartered with a capital stock of $60,000 by J. M. Bradley, B. F. Wortham and W. T. Cosgrove.

ST. LOUIS, MO.—The Davis Creek Coal Co. has been incorporated with a capital stock of $75,000 by J. J. Wells; J. L. Rowland, of Novinger, Mo.; L. L. Brande, of Chicago, Ill.; Edward H. Conrades and R. E. Rombauer. The company proposes to operate coal mines and also to generate and distribute electricity for lamps and motors.

FAIRVIEW, MONT.—The Jennison Lt. & Pwr. Co. has been incorporated with a capital stock of $100,000 for the purpose of building an electric light and power plant near here. The incorporators are Charles W. Jennison, of Williston; Herman W. O. Frank and William Miller, of Minneapolis, Minn., and Warren Jennison, of Fairview.

BELLEFONTE, PA.—The Slab Cabin El. Co. has been granted a charter with a capital stock of $5,000 to operate in Ferguson Township. The office of the company is Bellefonte. A. W. Lee is one of the incorporators.

CLEARFIELD, PA.—The Rossiter El. Co. has been chartered with a capital stock of $5,000 to operate in Cance Township. The office of the company will be in Clearfield. A. J. Musser is among the incorporators.

EASTON, PA.—The Butler-Edward Co. has been chartered with a capital stock of $5,000.

CLINTON, TENN.—The Cumberland Pwr. & Ice Co. has been incorporated with a capital stock of $25,000 by J. P. Stanton, Samuel Watts, E. M. Beasley and others.

BECKLEY, W. VA.—The Beckley Utilities Co. has been incorporated by G. C. Hedrick, E. L. Ellison and W. W. Wilkes, of Beckley; Theodore Swann and J. E. Brown, of Charleston, W. Va. The company is capitalized at $100,000 and purposes to supply water and power.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED SEPT. 8, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,109,657. SWITCH-CONTROLLING SYSTEM; C. E. Beach and H. W. Doughty, Binghamton, N. Y. App. filed Oct. 31, 1910. Automatic fire-alarm signal.

1,109,678. ELECTROMAGNETIC DEVICE; E. M. Jones, Atlanta, Ga. App. filed Nov. 7, 1907. Railroad track signal.

1,109,686. TELEPHONE EXCHANGE SYSTEM; F. R. McBerty, New Rochelle, N. Y. App. filed Nov. 10, 1910. Mechanical trunk-line switching.

1,109,689. ELECTRIC-CIRCUIT CLOSER AND BREAKER; T. H. McQuown, Cambridge, Mass. App. filed Nov. 24, 1906. For automatic recorders, ignition devices, etc.

1,109,703. TELEPHONE-EXCHANGE SYSTEM; F. N. Reeves, New York, N. Y. App. filed March 20, 1912. Automatic selector control.

1,109,707. SYSTEM OF ELEVATOR CONTROL; J. C. Smith, Louisville, Ky. App. filed July 5, 1911. Acceleration and safety devices.

1,109,726. POT-HEAD; P. F. Williams, Chicago, Ill. App. filed Jan. 26, 1911. End-piece connection.

1,109,733. FUSE HOLDER; H. W. Young, Chicago, Ill. App. filed April 28, 1913. Refillable-cartridge safety fuse.

1,109,735. ELECTRIC ATTACHMENT FOR CARBURETORS; A. S. Bignell, Bergerville, Quebec, Canada. App. filed Aug. 23, 1913. Heats for starting.

1,109,737. COUPLING; J. W. Coffman, Springfield, Ill. App. filed March 24, 1913. Railroad cable and pipe connections.

1,109,764. ELECTRODE FOR VAPOR-ELECTRIC APPARATUS; C. A. Kraus, Newton Highlands, and R. D. Mailey, Lynn, Mass. App. filed June 30, 1910. Anode temperature control.

1,109,770. ELECTRIC SWITCH; A. B. Lee, Oakland, Cal. App. filed May 11, 1912. Gas-engine ignition.

1,109,778. RELAY CONTACT DEVICE; G. C. Murphy, Louisville, Ky. App. filed Jan. 14, 1912. Solenoid type for railroad signal.

1,109,818. TELEGRAPH KEY; R. L. Boulter, Los Angeles, Cal. App. filed March 29, 1912. Vibrating transmitter.

1,109,830. QUADRUPLEX TELEGRAPH SYSTEM; J. Gott, Hove, Brighton, Eng. App. filed May 9, 1912. Double differentially wound polarized relay.

1,109,850. ELECTRIC SLOW-DOWN DEVICE; D. L. Lindquist, Yonkers, N. Y. App. filed Feb. 17, 1910. Reversible motor for elevators.

1,109,859. FIRE ALARM; M. Moloney, Christchurch, New Zealand. App. filed Feb. 14, 1912. Thermostat switch.

1,109,878. ALARM CABLE; J. Sulzbacher, New York, N. Y. App. filed Dec. 30, 1911. Signal and thermostatic.

1,109,879. RAILWAY SIGNALING SYSTEM; L. H. Thullen, Edgewood Park, Pa. App. filed Feb. 5, 1904. Track, block, power and signal system.

1,109,880. SIGNALING SYSTEM FOR RAILWAYS; L. H. Thullen, Edgewood Park, Pa. App. filed Aug. 22, 1904. Return circuit by track rails; alternating current.

1,109,881. SIGNALING SYSTEM FOR RAILWAYS; L. H. Thullen, Edgewood Park, Pa. App. filed Aug. 22, 1904. Direct-current or alternating-current, power and relay signal.

1,109,886. MANUFACTURE OF ELECTRIC FILAMENTS; C. A. von Welsbach, Vienna, Austria-Hungary. App. filed Aug. 9, 1898. Platinum core volatilized from an osmium coating.

1,109,887. MANUFACTURE OF ELECTRIC FILAMENTS; C. A. von Welsbach, Vienna, Austria-Hungary. App. filed Aug. 24, 1899. Osmium and partly reduced oxide of thorium.

1,109,888. MANUFACTURE OF ELECTRIC FILAMENTS; C. A. von Welsbach, Vienna, Austria-Hungary. App. filed Aug. 24, 1899. Osmium and zirconium alloy.

1,109,899. BRUSH FOR ELECTRIC CONTACTS; J. E. Coles and E. L. M. Ragonot, Paris, France. App. filed Nov. 1, 1913. Made of wire filaments.

1,109,901. REVERSIBLE BRUSH HOLDER FOR DYNAMOS; J. L. Creveling, New York, N. Y. App. filed Aug. 29, 1911. Constant polarity.

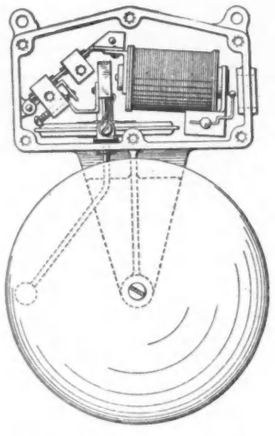
1,109,909. WIRELESS OSCILLATOR; H. P. Dwyer, San Francisco, Cal. App. filed Aug. 5, 1912. For generating long continuous waves.

1,109,919. SWITCH KEY; A. F. F. Gilson, Closter, N. J. App. filed Feb. 10, 1914. Prevents rebound of listening and ringing key.

1,109,940. ELECTRICAL APPARATUS; H. E. Reeve, New York, N. Y. App. filed Feb. 17, 1911. Flexible diaphragm joint.

1,109,947. SWITCH KEY; G. P. Tromp, New York, N. Y. App. filed Feb. 10, 1914. Spring brake to prevent rebound.

1,109,950. SIGNALING APPARATUS; A. Andren, Brooklyn, N. Y. App. filed Jan. 26, 1909. Elevator flash signal.



1,109,940—Electrical Apparatus

1,109,960. AUTOMATIC TELEPHONE-TESTING SYSTEM; W. L. Campbell, Chicago, Ill. App. filed April 1, 1907. Manual test of "busy" or "idle."

1,109,968. TOY CONSTRUCTION; J. L. Cowen, New York, N. Y. App. filed April 22, 1912. Railroad-track conductor and guide.

1,109,969. ELECTRIC BELL; W. J. Cook and M. M. Breuer, Denver, Col. App. filed May 24, 1912. Alternating-current or direct-current vibrator.

1,109,996. THERMOSTAT; F. J. P. Kuhlmann, San Francisco, Cal. App. filed Oct. 14, 1912. For operating switches, valves, etc.

1,110,012. TIMBRE CONTROLLER FOR ELECTRICAL MUSICAL INSTRUMENTS; M. L. Severy, Arlington Heights, and G. B. Sinclair, Winthrop, Mass. App. filed Aug. 7, 1905. Magnetic string vibration.

1,110,021. ELECTRICALLY CONTROLLED SWITCH; H. E. White, Glen Ridge, N. J. App. filed July 15, 1912. Motor-starting series relay.

1,110,027. TELEPHONE SWITCHING SYSTEM; W. Aitken, Liverpool, Eng. App. filed Oct. 24, 1910. Automatic disconnecting branch exchange.

1,110,028. HIGH-FREQUENCY ALTERNATOR; E. F. W. Alexanderson, Schenectady, N. Y. App. filed Oct. 19, 1911. Inductor design.

1,110,029. HIGH-FREQUENCY ALTERNATOR; E. F. W. Alexanderson, Schenectady, N. Y. App. filed Oct. 19, 1911. Improvement on inductor (patent No. 1,008,577).

1,110,039. SERIES-PARALLEL CONTROL SYSTEM; E. R. Carichoff, Schenectady, N. Y. App. filed April 15, 1913. Operating windings in the motor circuit.

1,110,071. AUTOMATIC TRUNKING SYSTEM; E. A. Mellinger, Chicago, Ill. App. filed June 10, 1909. Grouping control.

1,110,076. INCANDESCENT ELECTRIC LAMP; D. J. O'Brien, San Francisco, Cal. App. filed June 14, 1905. Parallel straight filaments.

1,110,094. SYSTEM OF CONTROL FOR ELECTRIC MOTORS; E. S. Zuck, Cleveland, Ohio. App. filed Jan. 3, 1911. Combined auxiliary and main circuits.

1,110,099. LAMP SOCKET; V. G. Apple, Dayton, Ohio. App. filed April 8, 1914. For automobiles, etc.

1,110,110. FLASHLIGHT; W. E. Compo, Toledo, Ohio. App. filed Feb. 19, 1914. Dry-cell attachment.

1,110,151. PROTECTIVE DEVICE; H. A. Steen, Milwaukee, Wis. App. filed July 22, 1911. Alternating-current time relay.

1,110,152. ELECTROMAGNETICALLY OPERATED THERMOSTAT; H. A. Steen, Milwaukee, Wis. App. filed July 22, 1911. Alternating-current field.

1,110,153. THERMOSTAT; H. A. Steen, Milwaukee, Wis. App. filed July 22, 1911. Movable heating coil.

1,110,163. ELECTRIC-LAMP RECEPTACLE FOR SIGNS; G. B. Thomas, Bridgeport, Conn. App. filed Nov. 25, 1910. Inserted from the rear.

1,110,166. MACHINE FOR PRODUCING ELECTRICAL COILS; C. R. Underhill and D. J. Kelsey, New Haven, Conn. App. filed Sept. 30, 1912. Wire and tape winding.

1,110,179. LIGHTNING ARRESTER; E. Bennett, Olmstead, Utah. App. filed Aug. 26, 1908. Spark-gap with movable arc.

1,110,184. FIRELESS COOK-STOVE OR COOKER; E. L. Brown and M. Murphy, Janesville, Wis. App. filed July 26, 1913. Automatic cut-off.

1,110,193. ATTACHMENT PLUG; E. E. Dougherty, San Bernardino, Cal. App. filed Feb. 14, 1914. Segmental screw-thread.

1,110,208. PROCESS OF ELECTRICALLY TREATING, MELTING AND REFINING METALS; C. A. Keller, Paris, France. App. filed Aug. 12, 1902. Casting ladle is taken to the electrodes.

1,110,228. TELEPHONE RECEIVER; A. Plecher, Las Animas, Col. App. filed Feb. 3, 1911. Annular magnet.

1,110,253. MEANS FOR PRODUCING OSCILLATING CURRENTS OF HIGH FREQUENCY; A. H. Cohen, San Francisco, Cal. App. filed Feb. 3, 1913. Parts exposed for inspection.

1,110,254. MAXIMUM-DEMAND ELECTRIC METER; L. H. Conklin, East Orange, N. J. App. filed Nov. 16, 1910. For three-phase system.

1,110,259. ELECTRIC-LINE-APPARATUS PROTECTOR; P. K. Higgins, Los Angeles, Cal. App. filed Oct. 22, 1903. Fusible core and carbon envelope.

1,110,261. APPARATUS FOR PERFORATING RECORD CARDS; H. Hollerith, Washington, D. C. App. filed Feb. 4, 1914. Improvement on patent No. 682,197.

1,110,271. SWIVEL ATTACHMENT PLUG; C. D. Platt, Bridgeport, Conn. App. filed Feb. 26, 1914. Contact and latch construction.

1,110,285. ELECTRICALLY OPERATED HAMMER; F. E. Brixius, Manitowoc, Wis. App. filed April 19, 1913. Solenoid-operated riveter.

13,798 (reissue). MEANS FOR RECEIVING INTELLIGENCE COMMUNICATED BY ELECTRIC WAVES; G. W. Pickard, Amesbury, Mass. App. filed March 9, 1912. (Original patent No. 877,451, dated Jan. 21, 1908; division of original patent No. 836,531, dated Nov. 20, 1906.) Rectifier and detector